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Trends that drive a paradigm shift in India's renewable energy sector

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The world's future depends significantly on how we power our present needs. As the adverse effects of climate change are becoming more pronounced with every passing year, the choice between renewable and non-renewable sources of electricity is clear and has become urgent. More so because the window for meeting global climate goals is closing fast. India has committed to reach net zero carbon emissions by 2070. Thankfully, compared to the rest of the world, India is already on the next level when it comes to mitigating climate change through renewable interventions. While the country plans to add 50 GW of renewable energy capacity annually to reach the target of 500 GW by 2030, bringing solar and wind into the country's energy mix has been one of the most innovative moves.

Solar and wind energy currently contribute more than 50% of the total renewable capacity of the country. According to official data, India had a fully renewable energy capacity of 168.9 GW, including 67.82 GW of solar power and 43.20 of wind power, as of 30th May 2023. Not only is the country quickly scaling up its renewables capacity, but the results of the efforts are also visible in multiple emerging trends defining India's solar and wind industries. Following are six of the most noticeable trends in India's renewable energy space:

Domestic solar rooftop installations on the rise

Due to increasing awareness among residential consumers and government subsidies for this segment, there has been a spurt in solar rooftop installations nationwide. According to the Ministry of Renewable Energy, 8877 MW of solar rooftop capacity was added between September 2022 and March 2023. As a result, the average yearly solar rooftop installations in the past two years have crossed 2 GW compared to just 1.3 GW during FY20 and FY21. The most noticeable trends in rooftop usage are encouraged by PSU Banks and NBFC by providing easy financing options to industrial users and subsidies available for residential users. Net metering policies adopted by many discoms have also contributed towards growth of this segment.

Accelerated solar module manufacturing

India is pursuing a strategy of supporting domestic manufacturers by revising import barriers and incentivizing domestic production. The growth of domestic solar photovoltaic module manufacturing capacity in India has been awe-inspiring in recent years. During March 2022 and March 2023, the country's cumulative solar module manufacturing capacity more than doubled from 18GW to 38GW, according to a report. It is estimated that in the next 3-5 years, India could see 100 GW of solar module manufacturing capacity, making the country self-sufficient and open to export possibilities. This will also provide direct and indirect employment to millions.

Wind power production jumps

India produced about 64.5 billion units of electricity from wind energy projects from April 2022 to January 2023. The Government has initiated steps to add offshore wind projects of a total capacity of 10 GW off the coasts of Gujarat and Tamil Nadu. A Global Wind Energy Council report estimates that the country can add around USD$10 billion in direct and indirect gross value (GVA) added to its economy by adding 19.4 GW of

offshore wind power capacity by 2026. While permit cost of energy from offshore is high, its advantage is high PLF which gives it a clear advantage over onshore wind in a RTC solution.

Ultra-Mega Renewable Energy Parks

The Government is implementing the scheme for developing Ultra-Mega Solar Power Parks. These are expected to provide plug-and-play benefits to project developers with statutory clearances for infrastructure such as land, roads, transmission system (internal and external) and polling stations. By 2024, the government aims to set up multiple ultra-mega solar parks with a power generation capacity of 40GW. This will boost the investment and construction of new projects since risk of land and connectivity has been taken away from the renewable project developers.

Tapping new age technologies

The renewable energy industry is also quickly tapping the potential of new-age technologies like blockchain, AI and Machine Learning (ML). For example, blockchain-based pilot projects have been tried for peer-to-peer solar power trading. Blockchain is also being tested for utilities like cyber security, transparency, reducing energy wastage and streamlining energy supply chains. Adopting AI and ML is further expected to enable companies to manage grids better and plan maintenance efficiently for better power output.

Module technology and battery storage

According to some estimates, USD 363 billion of investment in new generation technologies is needed through 2030, to meet CEA's optimal capacity mix projects. Out of this, USD 241 billion is required to build wind and solar power plants and USD 26 billion to build storage projects. The renewable energy industry in India is heavily investing in research and innovations in solar module and battery storage technologies. The solar industry is waking up to the utility of Mono PERC panels with multiple well-known advantages, such as higher energy yield and efficiency. Advanced mono technology such as mono PERC, HJT & these films, is expected to dominate the Indian solar industry soon.

Given the importance of energy storage, many innovations and activities can also be seen in this area. While India announced a 1000 MWh Battery Energy Storage System (BESS) in 2021 as a pilot project, BESS's overall energy storage capacity was 39.12 MWh on March 13, 2023. It is expected to grow as Budget 2023-24 announced a Viability Gap Funding support for 4000 MWh BESS. Pump storage is also emerging as a viable option to provide 5-8 hrs of energy storage capacity.

Way ahead

India is walking the talk on 'Green Growth' or development without harming the environment through policies, subsidies, and active participation of the private sector. As the country's economy continues to expand at a healthy speed, there is a growing realisation that all incremental energy demand must be met from renewable sources. The

above trends are in the right direction, aligning with this realisation for a sustainable, secure, and cutting-edge future. The electricity demand generally follows the GDP growth trajectory and with more and more consciousness towards climate change, adoption of EV in passenger vehicle and top wheeler segment, India is poised to demonstrate to the world its commitment towards reaching net-zero carbon emission and providing cost effective clean sources for our energy needs.

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