

Shaping India's Renewable Energy Landscape: Strategies for Scaling Solar and Hybrid Power Projects



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KEY HIGHLIGHTS ▼

- India's utility-scale solar market is growing rapidly, fueled by government policies and technology advancements.
- Juniper Green Energy uses robotic cleaning systems to enhance solar panel efficiency and reduce operational costs.
- Land acquisition challenges are addressed through partnerships, community engagement, and promoting the use of non-agricultural land.

How will India's utility-scale solar market evolve with the focus on renewable targets?

India's utility-scale solar market is evolving at a remarkable pace, driven by favourable government policies, declining solar technology costs, and the push for domestic solar component manufacturing under initiatives like "Make in India." These developments are decreasing India's dependence on imported solar modules, mainly from China, while attracting large-scale investments in solar infrastructure. Moreover, government auctions and favourable power purchase agreements (PPAs) are making utility-scale solar projects more attractive to investors.

Ongoing advancements in energy storage, grid management technologies, and government incentives such as tax breaks and subsidies for renewable energy projects are further accelerating this progress. The declining cost of solar panels, coupled with advancements in photovoltaic (PV) technology, is pushing solar energy closer to cost parity with conventional energy sources. With India aiming for 280 GW of solar capacity by 2030, the sector is set for continued expansion. As both international and domestic companies participate in auctions, this growth will enhance energy security while contributing to the country's broader climate goals.

How does Juniper Green Energy use technology to boost efficiency and cut costs in solar projects?

Currently, we have seven operational solar projects spread across Rajasthan, Gujarat, and Maharashtra. A significant challenge these projects face is the buildup of dust and other contaminants on the photovoltaic (PV) panels, which can severely impact energy efficiency and output. Research indicates that clean solar panels can generate up to 30% more energy than those that are dirty.

To tackle this issue, we have integrated robotic cleaning systems across all our projects. These advanced cleaners are outfitted with advanced sensors and automation technology, enabling it to navigate the solar fields autonomously. It

effectively removes debris without water, which is particularly advantageous in water-scarce regions. By minimizing the need for human intervention, the robotic systems also significantly reduce safety risks associated with manual cleaning on expansive solar installations. The adoption of automated cleaning systems not only improves energy output but also lowers long-term operational costs and allows our team to redirect their focus toward more strategic tasks, enhancing overall efficiency.

What challenges does Juniper Green Energy face in renewables, and how are they tackled?

Given the growing demand for renewable energy in India, the scarcity of suitable land has become a pressing issue. The high population density and competing uses for land—such as agriculture and urban development—make it challenging to secure adequate sites for solar and wind farms. Additionally, the fragmented nature of land ownership in rural areas, where smallholders' own parcels of land, makes it difficult to consolidate enough contiguous space for large projects.

This fragmentation often leads to protracted negotiations and increased costs, impacting project viability. To address these issues, we are exploring partnerships with local governments to streamline the land acquisition process and consider land leasing options instead of outright purchases. We are also advocating for the use of degraded or non-agricultural land for solar installations to minimize competition with agricultural needs.

Moreover, we engage with local communities early in the project planning phase, conducting outreach to highlight the potential benefits of renewable energy projects, including job creation and improved infrastructure. These efforts not only help in acquiring the land but also ensure that projects move forward with community support.

How have government policies impacted utility-scale solar growth in India?

The domestic solar manufacturing industry in India has made significant strides, driven by the

government's ambitious renewable energy targets. As of 2023, India has emerged as one of the top five solar markets globally, with solar installed capacity crossing 60 GW. The industry has attracted investments worth over ₹1.5 trillion (\$18.3 billion), and solar tariffs have dropped by over 70% in the last decade.[1]

The government has also launched several initiatives. For example, the Production Linked Incentive (PLI) scheme offers incentives to domestic manufacturers, while the Basic Customs Duty (BCD) imposed on imported solar cells and modules aims to promote local production. The National Solar Mission targets 280 GW of solar capacity by 2030, providing a clear roadmap for the industry's growth.

Going forward, we would also like to see continued incentives for domestic solar manufacturing to ensure India can compete globally. Secondly, simplifying the land acquisition process would greatly benefit developers. Lastly, as hybrid projects become more common, we need clearer guidelines and incentives for balancing solar and wind resources, as well as storage solutions, to ensure the success of such initiatives.

What is Juniper Green Energy's long-term vision for India's renewable energy goals?

Juniper is dedicated to advancing India toward a sustainable energy future through its extensive portfolio of renewable power projects. We are aiming for an expansion of 10 gigawatts by 2030. For the immediate future, we plan to commission 1.5 gigawatts of capacity by June 2025 with \$2 billion already allocated to projects under construction. We are fully funded for 3.8 gigawatts of capacity till June 2026, with backing from our investors, AT Capital and Vitol. These investments will further consolidate our position in the renewable energy space, as we continue to expand our footprint across India. By aiming to make clean energy accessible and affordable for all, we are addressing critical energy challenges faced by various communities.