

India Solar Energy Market Assessment, By Technology [Solar Photovoltaic, Concentrated Solar Power], By Application [Residential, Commercial, Industrial, Utility], By Region, Opportunities and Forecast, FY2018-FY2032F

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Report description:

India solar energy market is projected to witness a CAGR of 16.33% during the forecast period FY2025-FY2032, growing from USD 9.87 billion in FY2024 to USD 33.09 billion in FY2032.

The Indian solar energy sector is experiencing significant growth due to multiple factors. The most crucial factor is the support from the government and its policies aimed at promoting solar energy development. The government and higher authorities have established aggressive targets to achieve 280 gigawatts of solar energy installed capacity by the year 2030, which is part of an overall ambitious target of 500 gigawatts from non-fossil fuel energy sources. To further support these initiatives, various policies have been implemented, such as subsidies and tax benefits, which encourage investments in solar projects.

The country enjoys sunlight for about 300 days a year, which puts India at an upper hand in harnessing solar energy. Also, the cost of solar photovoltaic panels has reduced in the last decade due to development in the manufacturing process and the economics of scale. The decrease in cost has made solar energy a more viable and appealing option for businesses, industries, and residential users in the country.

Furthermore, India is dedicated to lowering its carbon emissions and increasing its reliance on renewable energy as part of its climate change objectives. The nation has established ambitious targets under the Paris Agreement, aiming to source 40% of its total energy requirements from renewable sources by 2030. Solar energy plays an essential role in meeting these targets, which will further stimulate the growth of the solar energy market.

For instance, in May 2024, India achieved a milestone by adding over 10 GW of solar capacity in the first quarter of 2024, marking the highest quarterly installations to date. Solar power contributed 66% of the 15.2 GW of new power capacity added during this period. States like Rajasthan and Gujarat led in large-scale installations, accounting for 38% and 35% of the capacity additions, respectively.

Government Policies is Driving Growth in the Solar Market

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The Indian government is encouraging the expansion of the solar energy sector through a variety of policies associated with subsidies, tax benefits, and improvements to the grid connection for solar power plants. The Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM KUSUM) is one such scheme aimed at enhancing energy and water security for farmers across the country. This policy allows farmers to set up solar power plants, install solar pumps, and even retrofit existing pumps, all with generous government subsidies.

By encouraging dispersed solar power generation PM-KUSUM looks to add a massive 34.8 megawatts of solar capacity by March 2026. Moreover, the government has included the Renewable Purchase Obligation as a part of the regulation wherein the solar power obligation prescribes that a set proportion of the company's overall power usage must be sourced from renewable energy, including solar. This also generates future demand for solar energy and rising industry.

Furthermore, the government has launched initiatives such as solar cities and parks, authorizing the establishment of 50 solar parks across 12 states with a target capacity of 37,490 MW. Till December 2023, 11 solar parks have been fully completed, contributing 8,521 MW of capacity, while an additional seven parks are partially completed, adding another 3,985 MW. Within these parks, solar projects totaling 10,237 MW have been successfully developed.

For instance, in October 2023, Adani Group plans to build 10 GW of solar manufacturing capacity by 2027, expanding its solar manufacturing business to meet growing demand in India and globally. Currently, Adani's capacity is 4 GW. The new capacity will be in Gujarat's Mundra Special Economic Zone. Adani Solar has secured over 3,000 MW in exports and raised USD 394 million in financing from Barclays PLC and Deutsche Bank's AG for solar manufacturing.

Technology Innovation is Shaping the Future of Solar Energy in India

Technological advancements are transforming the future of solar energy in India and floating solar is one of the promising developments. The floating solar is installed in lakes and reservoirs. It saves land and reduces water evaporation, thus making it ideal for a country with limited land resources. For example, the 600 MW floating solar plant in Madhya Pradesh is set to be one of the largest in the world. Another advancement is the solar-wind hybrid project, where solar and wind energy are combined to optimize resource use and ensure a more stable power supply.

Moreover, advancements in photovoltaic PV technologies such as bifacial solar panel and Passivated Emitter and Rear Cell or PERC technology is increasing energy output and efficiency. Bifacial panels can capture sunlight from both sides, increasing overall efficiency by 25%.

Additionally, the integration of energy storage solutions is addressing the intermittent nature of solar power. Innovations in battery technology like lithium-ion and solid-state batteries are promising longer life cycles and more storage capacity.

For instance, in August 2024, Germany-based AXITEC launched a 300 MW solar module manufacturing plant in Tiruvallur, Tamil Nadu. This facility is designed to produce solar modules utilizing N-type TopCon technology, which enhances the efficiency and performance of solar panels. The plant operates under the Domestic Content Requirement (DCR) and non-DCR categories, ensuring compliance with national standards for government-supported projects.

Solar Photovoltaic is Dominating the Market Share of Solar Energy

Solar Photovoltaic (PV) technology is the dominant force in India's solar energy market for multiple reasons, such as the government's focus on reducing dependency on fossil fuels, coupled with its ambitious target of installing approximately 280 gigawatts of solar power capacity by the year 2030. This initiative promotes renewable energy across the country. The target has fostered the creation of investment-friendly policies for solar PV projects, including subsidies and tax incentives, which propel the country's adoption of PV technology and Solar Energy.

The rapid drop in the cost of solar technology has significantly impacted the solar energy landscape. In the last ten years, the cost of solar PV modules has fallen dramatically, making solar energy feasible for both domestic and industrial purposes.

Consequently, the installed capacity of solar PV in India escalated from 1.60 gigawatts in the previous year to about 63.15 gigawatts by 2022, indicating a considerable increase.

Additionally, India receives significant sunlight, with nearly 300 days of sunshine each year, which is optimal for solar power harvesting. The development of solar parks and other large-scale projects also enhances the growth trajectory of solar photovoltaics.

For instance, in July 2024, ReNew Power has commissioned 400 MW of solar project in Rajasthan under its overall 600 MW Power Purchase Agreement (PPA) for 25 years with Solar Energy Corporation of India Limited (SECI). The project is based in the district of

Jaisalmer and will generate about 1,331 million units per year that will significantly contribute to the supply of clean energy in that region.

South Region is Expected to be the Fastest Growing Market

The southern region of the Indian states has witnessed the highest number of solar installations in the last year and holds the second-largest market share of the Indian solar energy market. This region comprises the states of Tamil Nadu, Karnataka, and Kerala. The same region benefits from receiving sunlight throughout the year, making it a prime area for solar energy generation. Other states, such as Andhra Pradesh and Telangana, have vast opportunities to harness solar energy, supported by state-specific promotional policies to develop solar projects. For example, incentives and subsidies have been shown to accelerate the adoption of solar power in Karnataka's solar policy. There has also been a strong government policy to encourage renewable energy, as demonstrated by various efforts such as the Karnataka Solar Policy and Tamil Nadu's Solar Energy Policy 2019.

Moreover, some southern states have seen the establishment of solar parks, which are more favorable in terms of efficiency. The combination of favorable climatic conditions, supportive government policies, and significant investments in regional infrastructure positions South India as a critical factor in realizing India's target of 500 GW of renewable energy capacity by 2030, including 280 GW sourced from solar energy systems.

For instance, in November 2024, Tata Power, an integrated power company, and the Asian Development Bank (ADB) recently signed a Memorandum of Understanding (MoU) during the ongoing COP29 Climate Conference in Baku, Azerbaijan. This agreement evaluates financing for various projects to enhance India's power infrastructure and promote renewable energy. The MoU focuses on key initiatives, including a 966 MW solar-wind hybrid project and a pumped hydro storage project, with an estimated cost of approximately USD 4.25 billion. The collaboration aims to support energy transition, decarbonization, and strengthening Tata Power's distribution networks.

Future Market Scenario (FY2025 – FY2032F)

□ Government support propels the future of Solar Energy in India. Initiatives such as the National Solar Mission, which aims to achieve 100 GW of solar power capacity, have played a crucial role in promoting the growth of solar energy. Additionally, incentives like solar subsidies, tax exemptions, and Renewable Purchase Obligations (RPOs) encourage individuals and businesses to invest in solar power.

□ The cost of photovoltaic panels has significantly decreased in the last decade due to improvements in the manufacturing process and economies of scale. As a result, solar energy has become more affordable, attractive, and accessible to businesses, industries, and households in India, which further boosts the demand.

□ Continuous innovation in solar technologies is increasing the efficiency and reliability of solar power. Advancements in solar panels, energy storage solutions, and integration with the grid have reduced the cost and increased the reliability of solar power generation in India.

□ India's growing population and expanding economy have led to a surge in energy demand. Solar energy presents a viable solution to meet this increasing demand, especially in rural areas with limited access to conventional electricity. Solar power bridges the energy access gap, ensuring that both urban and rural populations have reliable and affordable electricity.

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Key Players Landscape and Outlook

Continuous innovation characterizes the landscape of India's solar energy sector, as companies compete to outperform one another in terms of advancements in solar technology, energy efficiency, and unique features. The market outlook remains positive due to increasing energy consumption. Solar panel manufacturers are focused on government policies aimed at achieving greater energy efficiency and implementing sustainable environmental practices, which are likely to define the industry's future. Collaborations and the development of new technologies are expected to intensify competition in this fast-paced market. For instance, in November 2024, NTPC Green Energy Ltd. (NGEL), a subsidiary of NTPC, formed a joint venture (JV) with the New & Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP) to develop renewable energy projects in the state. This collaboration is set to attract an investment of around USD 23.30 billion, significantly enhancing energy security and sustainability.

The joint venture will focus on developing 25 GW of solar, wind, and hybrid energy projects, 10 GW of pumped hydro storage, and 0.5 million metric tonnes per annum (MMTPA) of green hydrogen and its derivatives. Over the next 25 years, it is expected to

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create approximately 106,000 jobs and generate financial benefits of USD 240.20 million for the state.

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