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Investing In Solar Manufacturing Company Have Multibagger Gains

OUR TOP PICKS

	CMP	TARGET
TATA POWER	477	600
PREMIER ENERGIES	1048	1350
ADANI ENTERPRISES	3116	4150
RELIANCE INDUSTRIES	2984	3550

DATE - 27/09/2024

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Thematic Report

Solar Manufacturing : Methodologies

Solar manufacturing refers to the comprehensive process of producing materials, components, and systems integral to solar energy generation. At its core, solar manufacturing includes the fabrication and assembly of key materials used in solar power systems, predominantly solar photovoltaic (PV) panels, which convert sunlight into electricity. The manufacturing process extends to various subcomponents of PV panels, such as wafers, cells, encapsulants, glass, backsheets, junction boxes, connectors, and frames.

In addition to these essential components, solar manufacturing also involves the production of input materials like silicon metal, polysilicon, and other semiconductor materials such as cadmium telluride, which are crucial for solar cell efficiency and performance. Moreover, the industry supports the creation of various supplementary products needed for the effective operation of solar energy systems. For solar thermal systems, particularly concentrating solar-thermal power (CSP) technologies, solar manufacturing involves the creation of heliostats (mirrors that focus sunlight), receivers (which collect concentrated solar energy), and thermal storage systems (to store heat for energy production during non-sunny periods). Each of these components plays a vital role in maximizing solar energy capture and converting it into usable electricity or thermal energy.

Solar energy, derived from the radiant light and heat of the sun, has become a cornerstone of renewable energy solutions, particularly in the context of reducing reliance on fossil fuels and mitigating carbon emissions. Solar power, the process of converting sunlight into electricity, is achieved primarily through two main technologies: **Photovoltaic (PV) systems** and **Concentrated Solar Power (CSP) systems**. Each of these systems operates on distinct principles and caters to different energy needs and scales.

- **Photovoltaic (PV) systems** are the most prevalent method of solar energy conversion. These systems rely on the photovoltaic effect, where certain semiconductor materials—commonly silicon—absorb sunlight and release electrons, generating an electric current. PV systems are composed of solar cells, which are grouped into modules and further combined into solar panels. These panels convert sunlight directly into electricity, which is then managed and converted into usable alternating current (AC) through an inverter. While PV systems can be installed in a variety of settings, from small residential rooftops to large solar farms, they can also be paired with battery storage systems to store excess energy for later use, particularly in off-grid scenarios. PV systems are favored for their scalability, relatively low maintenance, and ability to be deployed in diverse environments. However, challenges such as intermittency—where energy production fluctuates based on sunlight availability—and high initial installation costs are notable considerations.
- **Concentrated Solar Power (CSP)** systems focus on generating electricity through heat. CSP systems use mirrors or lenses to concentrate sunlight into a small area, creating intense heat that is used to drive a steam turbine connected to a generator. There are several types of CSP systems, including parabolic troughs, power towers, and dish Stirling systems, each employing different mechanisms for concentrating and capturing solar energy. CSP systems are most often used for large-scale power generation and are particularly advantageous due to their ability to store energy in the form of heat, allowing for electricity generation even when sunlight is unavailable, thus addressing one of the key challenges of solar energy—intermittency. However, CSP systems tend to be more costly to build and maintain, and their deployment is often restricted to regions with abundant direct sunlight.
- Both PV and CSP systems are central to the solar energy landscape, but they differ in key aspects such as efficiency, scalability, and energy storage potential. While PV systems are easier to install and more flexible in terms of location, CSP systems are often more efficient at large scales and can offer continuous power generation when integrated with thermal storage. In recent years, advancements in technology have reduced the costs of both PV and CSP, making solar energy increasingly competitive with traditional energy sources. The integration of energy storage solutions, hybrid systems combining solar with other renewables, and innovations like bifacial solar panels are shaping the future of solar energy. As these technologies continue to evolve, solar power is expected to play a pivotal role in the global energy transition, driving sustainable growth and reducing environmental impact.

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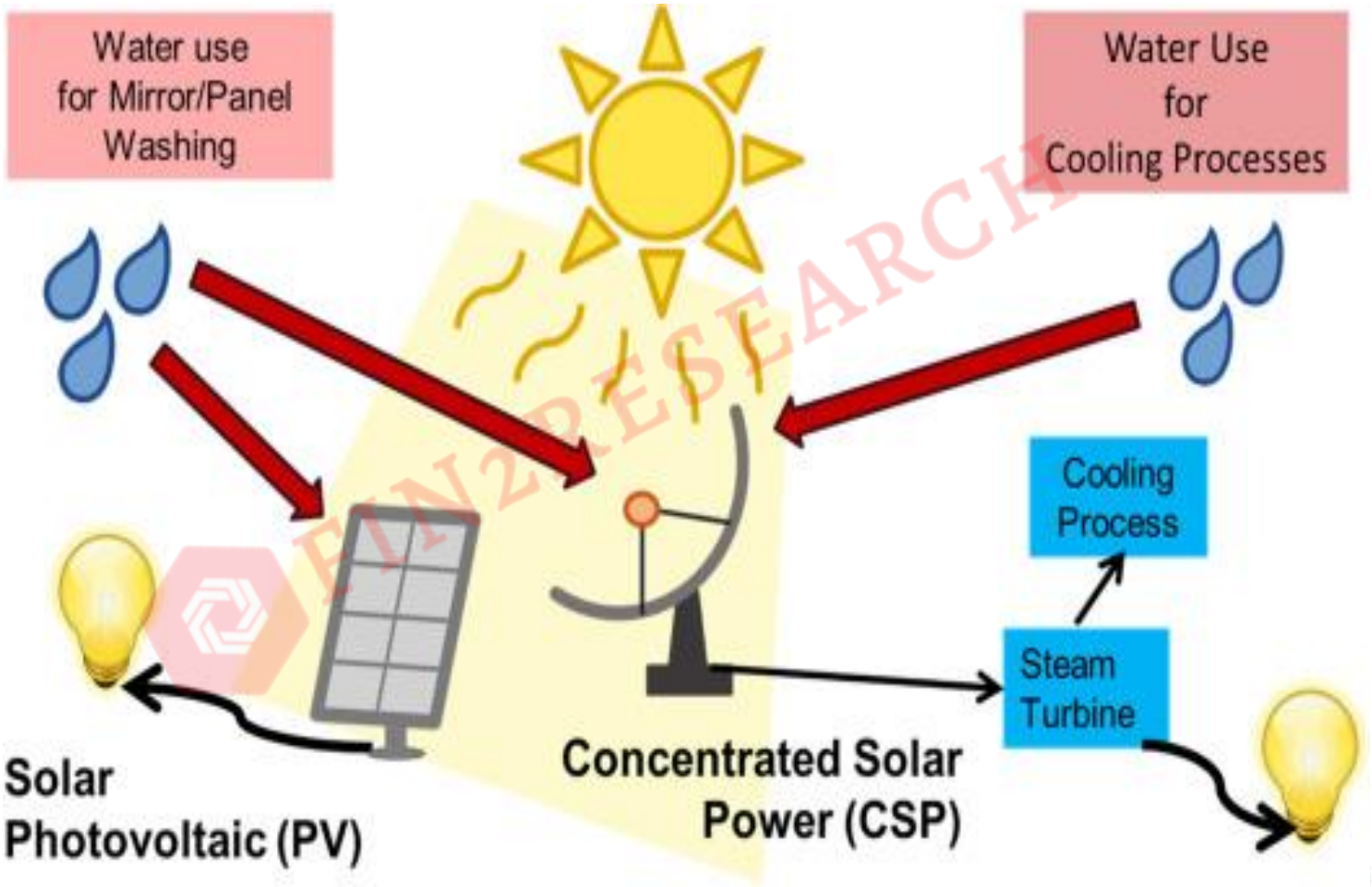

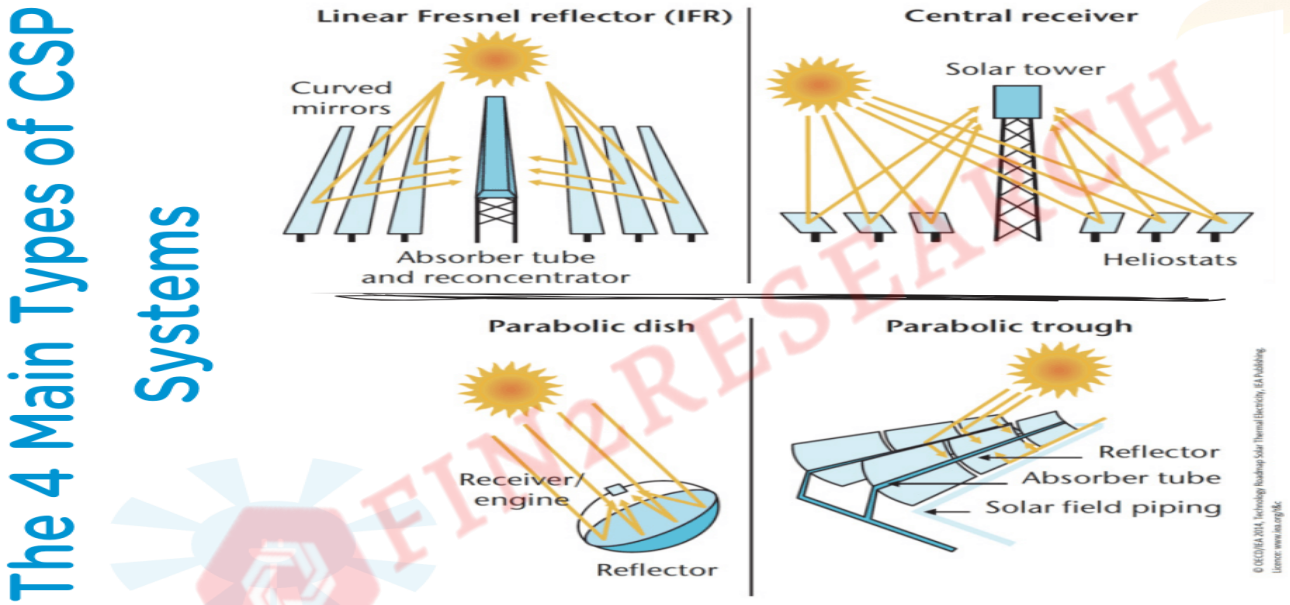

Source: International Energy Agency

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Solar Cell & Module

Solar Cells: A solar cell, also known as a photovoltaic cell, is an electrical device that transforms light energy directly into electricity. This is achieved through the photovoltaic effect, a physical and chemical phenomenon that defines the cell's electrical characteristics, such as current, voltage, and resistance, when exposed to light. Individual solar cells serve as the foundational electrical building blocks of larger photovoltaic modules.

The key raw materials used in solar cell manufacturing include:

- **Silicon Wafers:** The most crucial component of solar cells, silicon wafers are cut from silicon ingots obtained from high-purity silicon. The quality and purity of the silicon directly impact the performance and efficiency of solar cells.
- **Silver Paste:** This material is used to create conductive contacts on the front side of the solar cells. It plays a key role in collecting and transferring the electrical current generated by the silicon wafer, and is applied through a screen-printing process.
- **Aluminum Paste:** Applied to the backside of the solar cell, aluminum paste helps form a back surface field when fired in a furnace, which reflects electrons back into the silicon to be collected as electrical current, enhancing the overall efficiency of the cell.
- **Other Gases and Chemicals:** Solar cell production involves several other materials, such as dopants (e.g., phosphorus oxychloride for n-type doping or boron for p-type doping) and chemicals like hydrofluoric acid, which is used for cleaning and etching wafers by removing silicon dioxide layers.

Monocrystalline PERC solar cell manufacturing steps

Source: Frost & Sullivan Analysis

Solar Modules: A solar module is an assembly of solar cells arranged within a framework for easy installation. These modules use sunlight to generate direct current electricity. The manufacturing of solar modules primarily relies on solar cells, but additional materials are also required to ensure durability and efficiency.

Key components involved in solar module manufacturing include:

- **Backsheet:** The backsheet provides essential mechanical strength, electrical insulation, and moisture resistance, acting as a protective layer that insulates the solar cells. It also reflects light back toward the cells to enhance electricity generation while protecting the cells from environmental factors such as ultraviolet rays and humidity.
- **Encapsulant:** Encapsulants play a critical role in the transmittance of light and in holding the cell assembly together. They prevent short-circuiting by ensuring that solar cells do not come into direct contact with one another. The encapsulant must be stable at high temperatures and resistant to ultraviolet radiation over the long term to maintain the integrity of the module.
- **Glass and Auxiliary Products:** Solar glass is another crucial component, enabling the transmission of light while minimizing reflection. It must be highly transparent to allow maximum light absorption by the cells while providing mechanical strength and protection from external elements. Anti-reflective coatings are applied to reduce the reflection of light, ensuring optimal power output. The tempered glass adds durability, making the modules resistant to environmental stressors.

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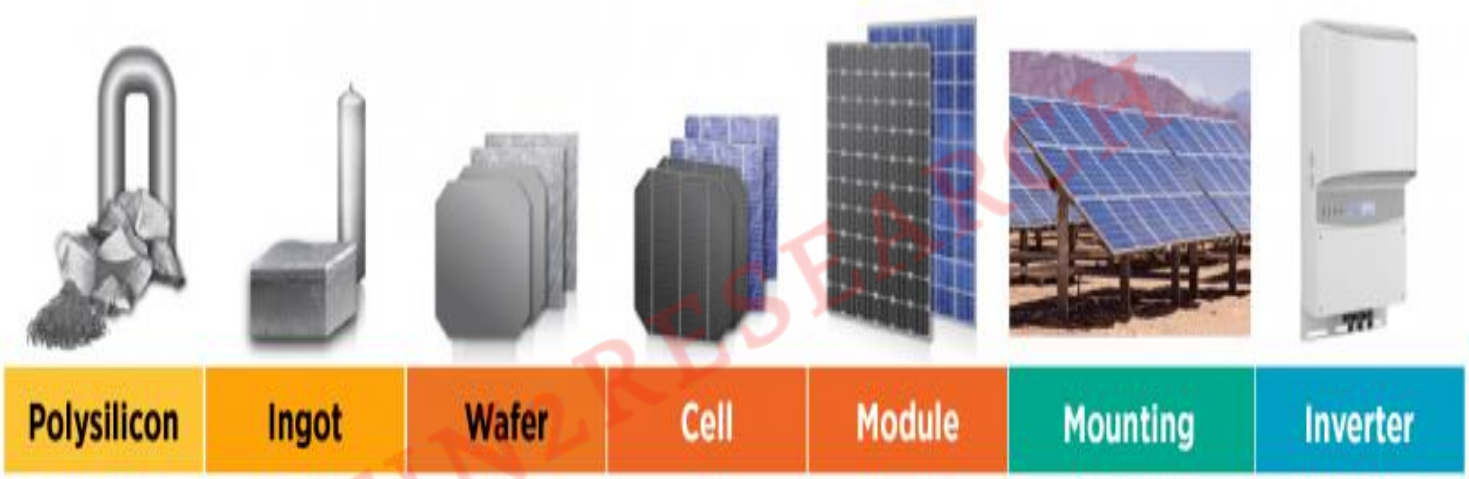
PV Module Manufacturing Cycle



- **Polysilicon Production:**
  Polysilicon, the base material for creating photovoltaic (PV) cells, is produced through high-purity processes. Two main methods are commonly used:
  Siemens Process: In this method, silicon reacts with hydrogen and chlorine, forming a gas compound containing silicon, hydrogen, and chlorine. This gas is passed over a heated silicon filament, where the heat triggers the silicon to deposit onto the filament, creating a large U-shaped polysilicon rod. The process is closed-loop, reusing hydrogen and chlorine, making it efficient and sustainable.
  Fluidized Bed Reactor: Here, silicon beads are suspended in a heated vessel, where silicon-hydrogen gas is introduced. The gas deposits silicon onto the beads, causing them to grow heavier and eventually settle at the bottom of the vessel for collection.

- **Ingot and Wafer Production:**
  Polysilicon is further processed into solid silicon ingots and thin wafers that form the building blocks of PV cells. There are various processes involved:
  Czochralski Process: Polysilicon is melted, and a crystalline seed is dipped into the liquid. As the seed is slowly pulled upwards, a large single-crystal silicon ingot is formed in a cylindrical shape.
  Directional Solidification: Polysilicon is cooled from the bottom up, forming a multicrystalline silicon ingot. This method produces silicon in a different structure from the Czochralski process.
  Wafer Slicing: Once the silicon ingot is formed, it is sliced into thin wafers using diamond-coated wire saws. This process generates a silicon waste known as kerf. To reduce this waste, alternative methods like kerfless wafer production are used, where layers are pulled from a molten bath or gas-phase silicon deposition is utilized.

- **Cell Fabrication:**
  Silicon wafers are transformed into PV cells through several processes:
  Texturing: The wafer surface is chemically treated to remove any damage caused during slicing, and it enhances the wafer's ability to absorb sunlight more effectively.
  Doping: A gas containing specific dopants is introduced to the wafer, adding impurities that enhance its electrical conductivity and improve its photovoltaic properties.
  Metallization: Silver is screen-printed onto the wafer to form electrical contacts. This metallization process creates a network of conductive pathways that allow electricity generated by the PV cell to flow efficiently.

- **Module Assembly:**
  The final step in the process is assembling multiple PV cells into a solar module.
  Tabbing and Stringing: Copper ribbons are used to connect individual PV cells in series, forming an interconnected array of cells. This process ensures that the electricity produced by each cell can be combined and transferred.
  Lamination: The connected cells are sandwiched between sheets of polymer encapsulant and glass. This laminated structure is then heated in an oven to form a durable, waterproof protective layer, safeguarding the cells from environmental elements.
  Framing and Wiring: Finally, an aluminum frame is added for structural integrity. A junction box is also attached, containing diodes to prevent reverse current flow, and electrical cables are connected to facilitate integration with other modules or the grid.

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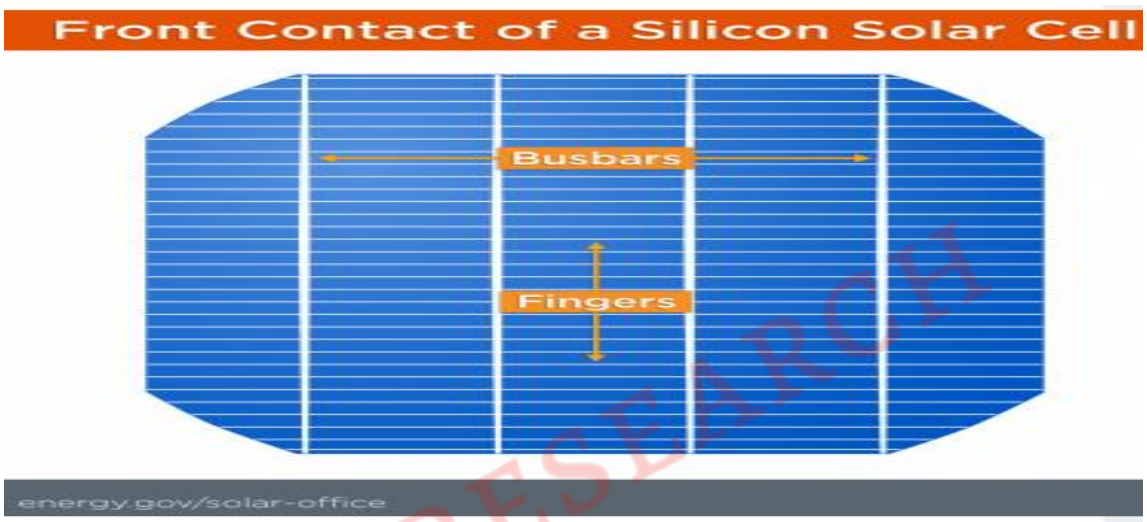


Thin Film PV Manufacturing:

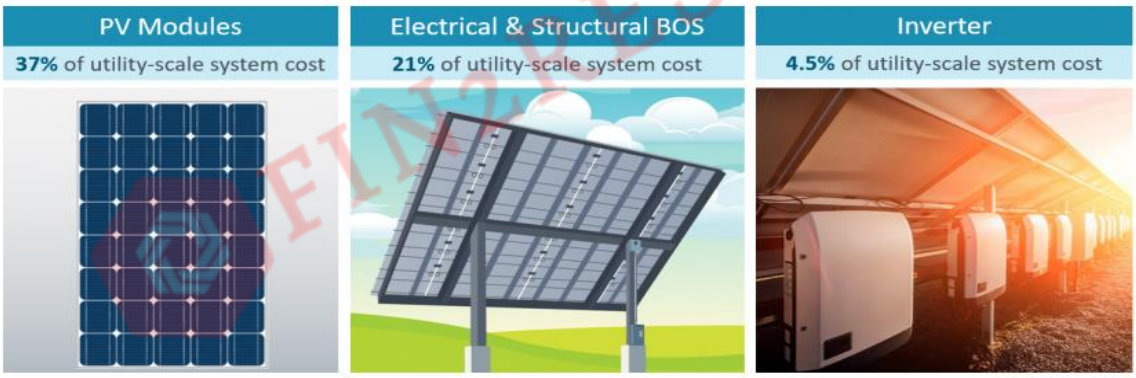
Thin film photovoltaic (PV) modules offer an alternative to traditional silicon-based PV systems by utilizing a different approach to produce solar energy. Instead of using thick silicon wafers, a thin layer of photovoltaic material is deposited onto a substrate. Cadmium telluride (CdTe) is one of the most commonly used materials in this process. The manufacturing process begins by applying a transparent conductive layer onto float glass. The photovoltaic absorber material is then deposited onto this conductive layer. A technique called close-spaced sublimation is used to heat the photovoltaic material, causing it to deposit evenly onto the glass substrate. Laser scribing is employed to create patterned strips on the cell and form pathways for intercellular electrical connections. Finally, the module undergoes encapsulation and assembly, where a second sheet of glass and an encapsulant are laminated to form a waterproof unit, ensuring the longevity and durability of the module. A junction box is attached to provide the necessary electrical connections for integration into solar systems.

Racking Systems:

Racking systems provide structural support for PV modules, whether they are installed on the ground or rooftops. Ground-mounted racking is typically constructed from steel, often coated or galvanized to protect against corrosion. These systems may also incorporate one-axis tracking mechanisms to follow the sun's movement, thereby improving efficiency. Tracking systems involve motors and mechanical components to adjust the angle of the modules throughout the day. Roof-mounted racking systems differ depending on the type of roof. For flat roofs, fixed-tilt racking is employed and often anchored with heavy blocks to keep the structure stable. On pitched roofs, racking is designed to attach directly to the rafters, creating a gap underneath the modules that promotes airflow, aiding in cooling and improving the overall efficiency of the system.

Power Electronics:

Power electronics play a crucial role in converting the direct current (DC) electricity generated by PV modules into alternating current (AC) electricity, which is compatible with the electrical grid. Key components of power electronics systems include power optimizers and inverters, both of which are assembled on circuit boards. During the assembly process, components such as transistors and diodes are carefully placed on the circuit board and soldered into position to create a functioning electronic system. After assembly, the circuit boards are coated with lacquer for protection against environmental elements. The final step in the process involves sealing the circuit boards in waterproof enclosures, which have ports for external connections. These housings ensure that the electronics are shielded from the elements, enabling the safe and efficient conversion of solar-generated electricity for grid use.




Global Market Outlook
For Solar Manufacture
"A strong global economy is the cornerstone of solar manufacturing growth—its scalability thrives on robust demand, supply chain resilience, and cross-border investments, paving the way for a sustainable energy future."

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Thematic Report

Global Economy Outlook

- The global economy is projected to maintain stable growth in the coming years, following a period of significant turbulence. Over the past few years, the global economy experienced substantial stress due to extended trade conflicts, a slowdown in investments, and the unprecedented impact of the COVID-19 pandemic. The economic downturn began in 2018, deepening into a recession by 2020 as the pandemic led to widespread economic disruptions and strict restrictions imposed by governments worldwide.
- Despite the severe contraction in economic activity during 2020 and parts of 2021, the global economy demonstrated remarkable resilience and rebounded sharply in 2021. However, challenges persisted in 2022, including the Russia-Ukraine conflict, rising inflation, economic slowdowns in the United States and Europe, and ongoing supply chain disruptions.
- By 2023, the global economy had stabilized, with real GDP growth recorded at 3.2%. This steady growth is expected to continue at a similar rate over the next three years. However, projections suggest a slight moderation to 3.1% growth in 2027 and 2028. The economic outlook is subject to potential headwinds, including the effects of higher interest rates implemented by central banks to control inflation and reduced government spending due to accumulated national debt.

Real GDP Growth by Select Regions & Countries – Historic and Forecast, World, CY2018 – CY2028E

Country / Region	CY2018	CY2019	CY2020	CY2021	CY2022	CY2023	CY2024E	CY2025E	CY2026E	CY2027E	CY2028E
World	**3.6%**	**2.8%**	**-2.7%**	**6.5%**	**3.5%**	**3.2%**	**3.2%**	**3.2%**	**3.2%**	**3.1%**	**3.1%**
United States	3.0%	2.5%	-2.2%	5.8%	1.9%	2.5%	2.7%	1.9%	2.0%	2.1%	2.1%
China	6.8%	6.0%	2.2%	8.4%	3.0%	5.2%	4.6%	4.1%	3.8%	3.6%	3.4%
India	**6.5%**	**3.9%**	**-5.8%**	**9.7%**	**7.0%**	**7.8%**	**6.8%**	**6.5%**	**6.5%**	**6.5%**	**6.5%**
North America	2.8%	2.1%	-3.0%	5.7%	2.3%	2.5%	2.6%	1.9%	2.0%	2.1%	2.1%
Europe	2.3%	2.0%	-5.4%	6.3%	2.5%	0.4%	0.8%	1.5%	1.7%	1.6%	1.6%
Asia and Pacific	5.3%	4.1%	-0.8%	7.1%	4.0%	4.8%	4.4%	4.2%	4.1%	4.1%	4.0%
Middle East and Central Asia	2.8%	1.7%	-2.4%	4.5%	5.3%	2.0%	2.8%	4.2%	3.8%	3.9%	3.6%
Africa	3.4%	2.9%	-1.7%	4.9%	4.0%	3.2%	3.5%	4.0%	4.0%	4.2%	4.3%
Latin America	0.5%	0.0%	-6.4%	7.5%	4.0%	1.5%	1.4%	2.7%	2.6%	2.5%	2.4%

Source: IMF, World Economic Outlook, Frost & Sullivan Analysis

Inflation Rate – Historic and Forecast, World, CY2018 – CY2028E

Country / Region	CY2018	CY2019	CY2020	CY2021	CY2022	CY2023	CY2024E	CY2025E	CY2026E	CY2027E	CY2028E
World	**3.6%**	**3.5%**	**3.2%**	**4.7%**	**8.7%**	**6.8%**	**5.9%**	**4.5%**	**3.7%**	**3.5%**	**3.4%**
United States	2.4%	1.8%	1.2%	4.7%	8.0%	4.1%	2.9%	2.0%	2.1%	2.1%	2.1%
China	2.1%	2.9%	2.5%	0.9%	2.0%	0.2%	1.0%	2.0%	2.0%	2.0%	2.0%
India	**3.4%**	**4.8%**	**6.2%**	**5.5%**	**6.7%**	**5.4%**	**4.6%**	**4.2%**	**4.1%**	**4.0%**	**4.0%**
North America	2.7%	2.0%	1.4%	4.7%	7.9%	4.2%	3.0%	2.1%	2.1%	2.2%	2.2%
Europe	2.2%	2.0%	1.1%	3.5%	9.9%	6.3%	3.4%	2.7%	2.5%	2.4%	2.4%
Asia and Pacific	3.1%	3.4%	3.2%	3.0%	6.6%	5.1%	5.0%	4.3%	3.6%	3.4%	3.4%
Middle East	8.3%	6.3%	9.8%	12.1%	13.9%	12.5%	10.7%	9.2%	8.0%	7.4%	7.3%
Africa	11.2%	8.9%	10.5%	12.7%	14.2%	18.2%	18.4%	14.4%	9.9%	9.0%	8.1%

Source: IMF, World Economic Outlook, Frost & Sullivan Analysis

Since CY2021, India has emerged as the fastest-growing large economy in the world, with a real GDP growth rate of 7.8% in CY2023, up from 7.0% in CY2022. This robust economic momentum is anticipated to persist, with India expected to maintain its position as the fastest-growing large economy over the next five years. The continued growth is expected to be supported by stable domestic demand and increased private investment.

In contrast, major global economies experienced a mixed performance in CY2023. The United States showed resilience with a 2.5% growth rate, driven by increases in consumer spending, non-residential fixed investment, state and local government spending, exports, and federal government expenditure. China's economy grew by 5.2% in CY2023, benefiting from the easing of COVID-19 restrictions at the end of CY2022 and the beginning of CY2023. Europe, however, faced a challenging economic environment, with GDP growth slowing to just 0.4% due to ongoing issues such as the war in Ukraine, high energy prices, and other economic pressures.

Inflationary pressures eased globally in CY2023, declining from a peak of 8.7% in CY2022 to 6.8%, with a projected further decline to 5.9% in CY2024. This easing is attributed to tighter monetary policies by central banks and a decrease in international commodity prices. However, core inflation is expected to decline more slowly, with a return to target levels anticipated in most regions by CY2025.

Despite facing the most significant monetary policy tightening cycle in four decades, severe banking sector stress, and conflicts in Ukraine and Israel, the global economy demonstrated resilience in CY2023. Disinflation, steady growth, easing supply constraints, reduced labor shortages, cooling energy prices, and moderating demand growth have contributed to a notable easing of inflation pressures. These trends are expected to continue into CY2024 and beyond, with the global economy projected to grow at a compound annual growth rate (CAGR) of 3.1% over the next five years.

In India, inflation decreased from 6.7% in CY2022 to 5.4% in CY2023. With rising consumer confidence and improved business sentiment, inflation in India is expected to remain stable over the next five years, hovering around 4%.

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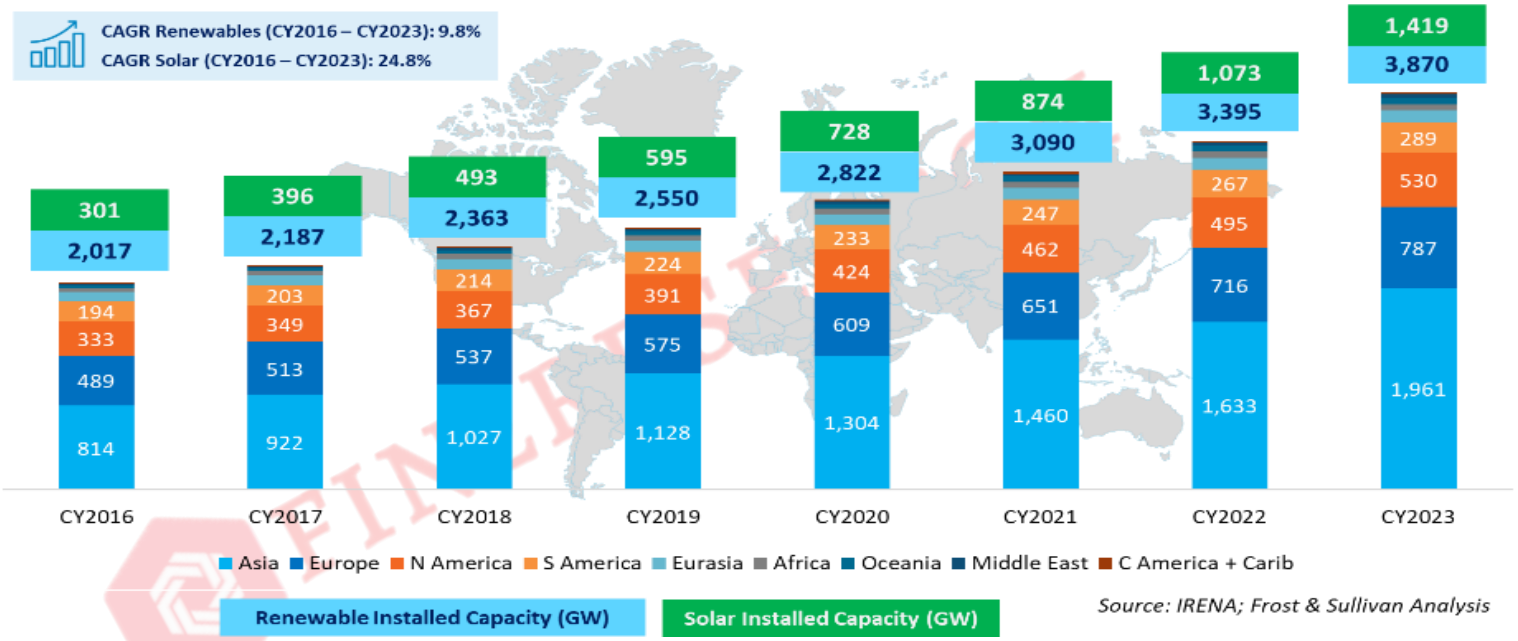
Thematic Report

Overview of the Global Solar Cell and Module Manufacturing Landscape



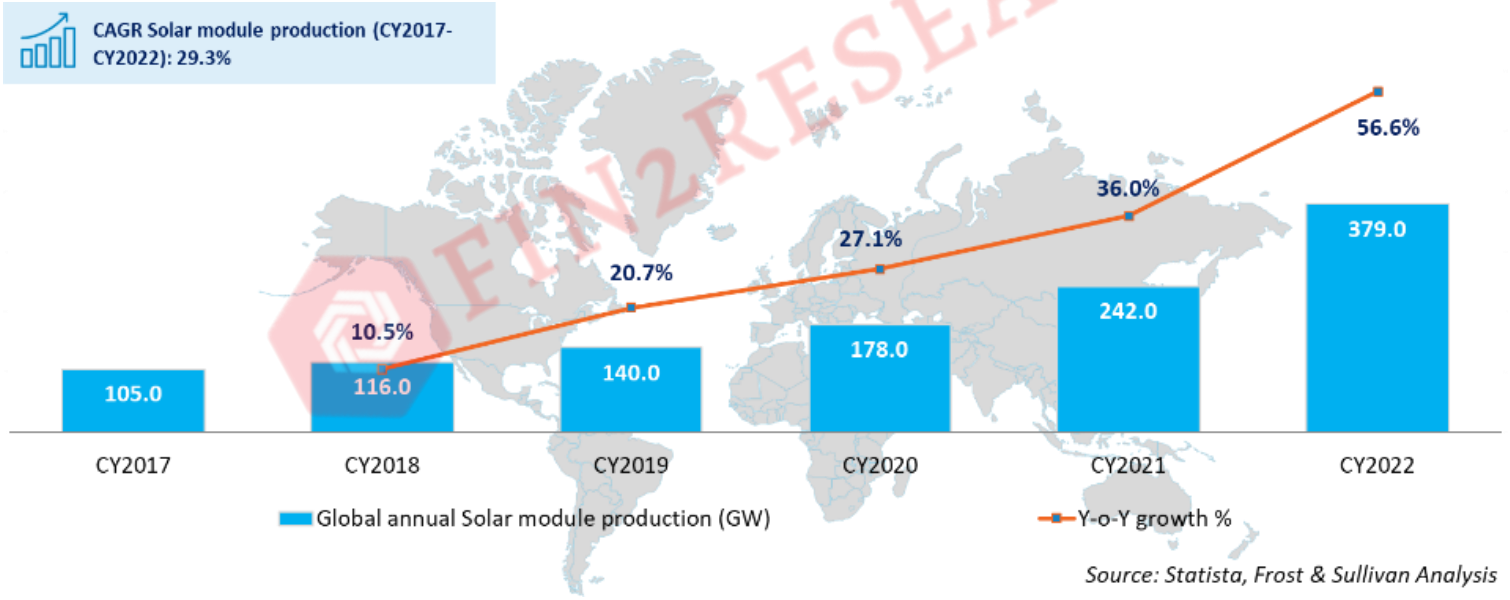
Source: IRENA; Frost & Sullivan Analysis

Global solar capacity is expected to grow rapidly, driven by climate challenges, ambitious national goals, and strong policy support. Solar energy is projected to reach 2,359 GW by 2027, surpassing hydropower by 2024, natural gas by 2026, and coal by 2027, making it the world's largest power source.

Despite disruptions like COVID and supply chain issues, solar power has shown resilience and continues to lead the renewable energy shift. The Russia-Ukraine conflict further highlighted the need for energy security, accelerating the global adoption of clean energy.

Major economies like China, the US, and India are pushing to double their renewable energy capacity in the next five years. Policies like the REPowerEU plan and the US Inflation Reduction Act are supporting solar investments, making it a competitive and preferred energy source. Solar is set to become the most cost-effective and widely used power option globally.

Global solar module production, GW, CY2017 – CY2022



Source: Statista, Frost & Sullivan Analysis

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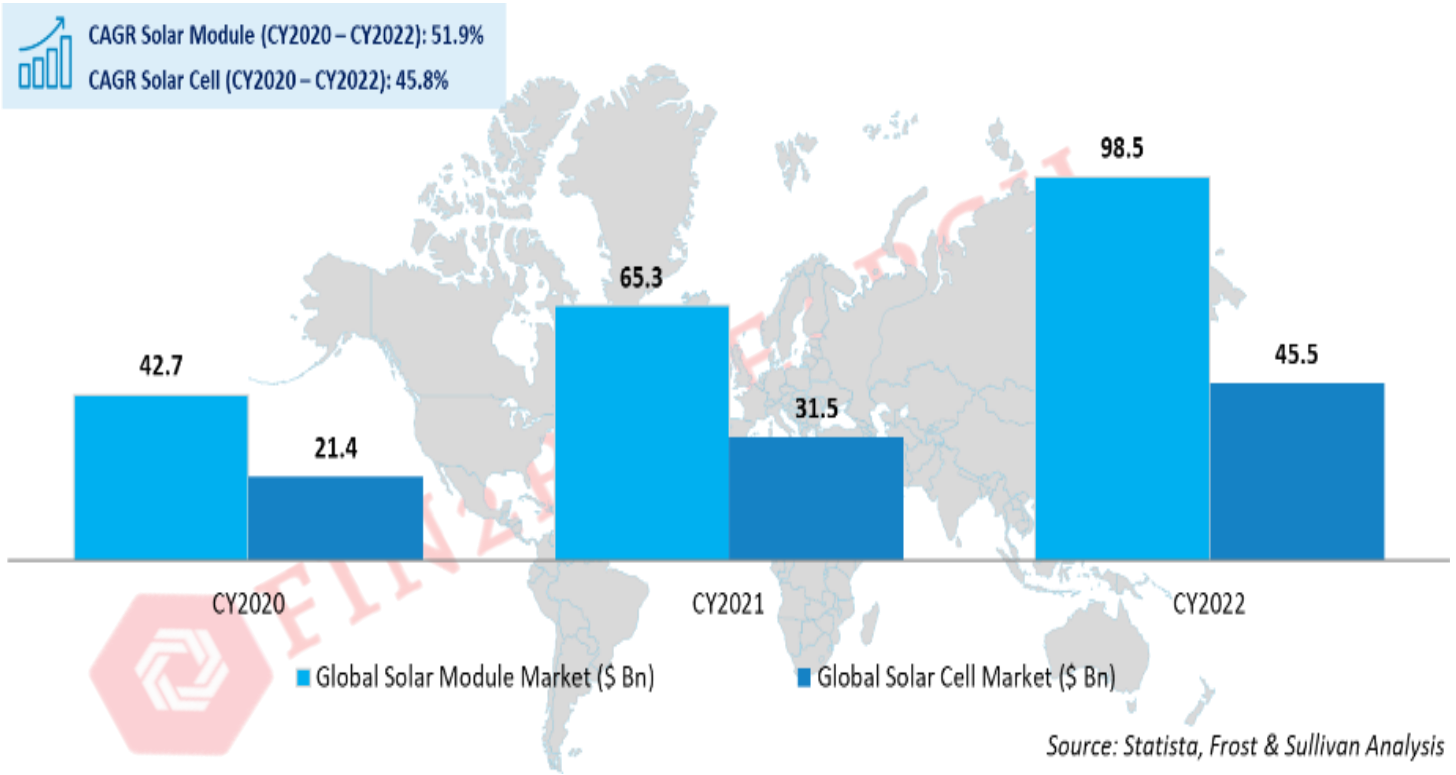
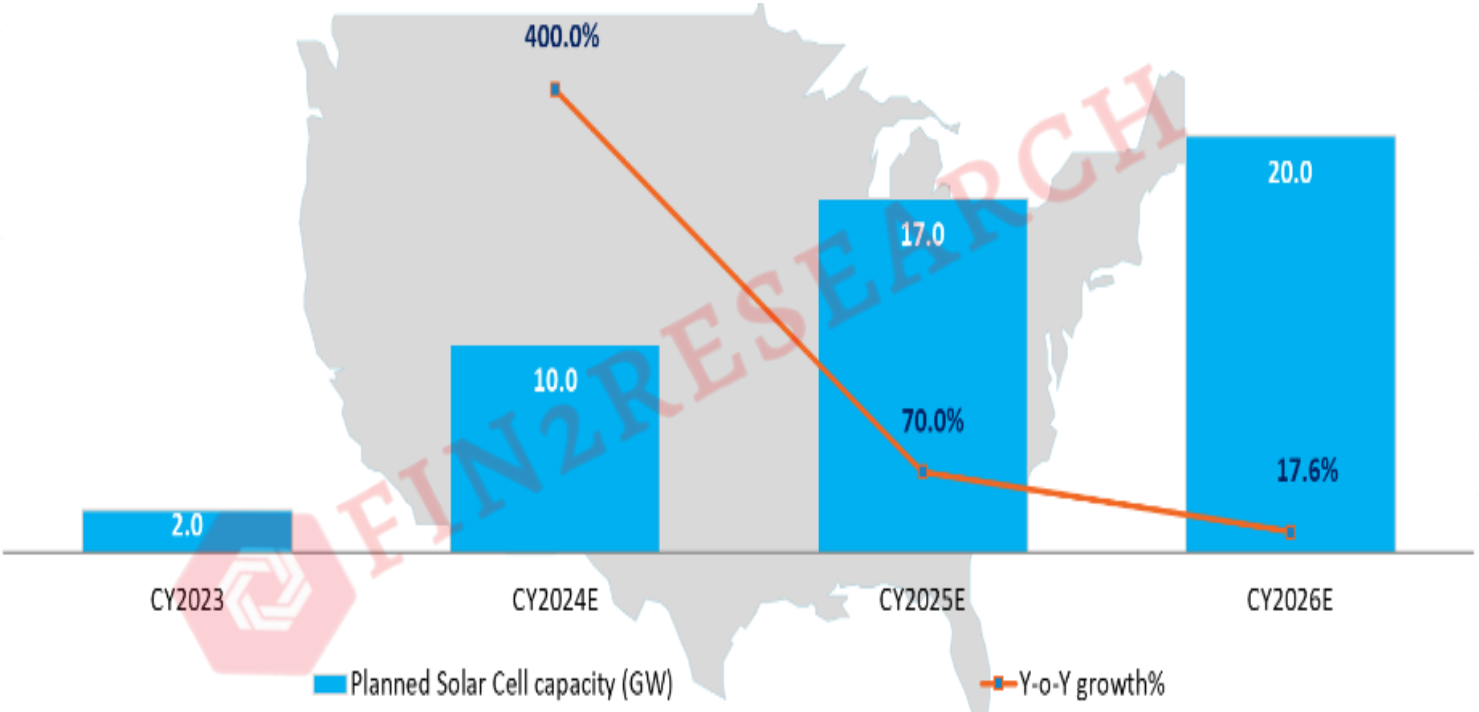
Global solar module and cell market, USD Bn, CY2020 – CY2022



Source: Statista, Frost & Sullivan Analysis

Upcoming solar cell manufacturing capacity in the United States, GW, CY2023 – CY2



Source: Statista, Frost & Sullivan Analysis

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- The global solar manufacturing landscape is evolving at a fast pace, driven by a surge in demand for renewable energy sources and heightened concerns over energy security. With countries striving to accelerate their green energy transitions, the need for solar photovoltaic (PV) components has increased exponentially. This global demand, coupled with supply chain disruptions and geopolitical shifts, has opened new avenues for emerging solar manufacturing players. India, with its established production infrastructure and government-backed incentives, is in a prime position to capitalize on this shift, particularly as global markets seek to diversify their supply chains and reduce dependence on dominant suppliers like China.

- In the United States, policies aimed at reducing reliance on imported solar products have presented India with a significant opportunity. The U.S. government's imposition of anti-dumping duties on solar imports from China and Taiwan, combined with the Inflation Reduction Act (IRA) of 2022, has driven demand for domestically produced solar components. While these initiatives have boosted U.S. module production capacity, the country faces a critical shortage in solar cell manufacturing. This gap, coupled with trade policies that restrict Chinese imports due to ethical and security concerns, has made India an attractive alternative. India's established solar manufacturing sector, backed by Production Linked Incentive (PLI) schemes, positions Indian manufacturers to supply solar cells to the U.S. market and close this capacity shortfall.

- The EU's Solar Energy Strategy targets an increase in solar generating capacity from 263 GW today to nearly 600 GW by 2030, aiming for solar to become the EU's largest source of electricity. However, with an annual production capacity of just 14.1 GW—covering only 25% of the solar panels installed in 2023—the European solar industry is currently not on track to meet this ambitious goal.

- The solar manufacturing sector is grappling with intense competition from low-cost imports, predominantly from China. Despite the EU's ambitious renewable energy targets and significant growth in solar PV installations, domestic manufacturers have struggled to compete with cheaper imports, leading to financial strain and plant closures. While the EU has introduced policies such as the Net-Zero Industry Act to support local production, its reliance on imported solar products, particularly solar cells, remains a challenge.

- This creates an opportunity for Indian manufacturers to step in as reliable suppliers, especially given the EU's growing focus on ethical sourcing and supply chain transparency. By expanding their solar manufacturing capacity and adhering to international standards, Indian companies are well-positioned to meet the EU's demand for solar components, particularly as Europe seeks to diversify its supply chains and reduce dependency on Chinese imports.

Domestic Market Oulook

For Solar Manufacture

"A robust domestic economy fuels the growth of solar manufacturing—driven by rising energy consumption, addressing peak and energy deficits, and India's expanding renewable capacity. With favorable price trends and decreasing reliance on imports, the industry is poised to meet both domestic demand and export opportunities, ensuring long-term energy security and sustainability."

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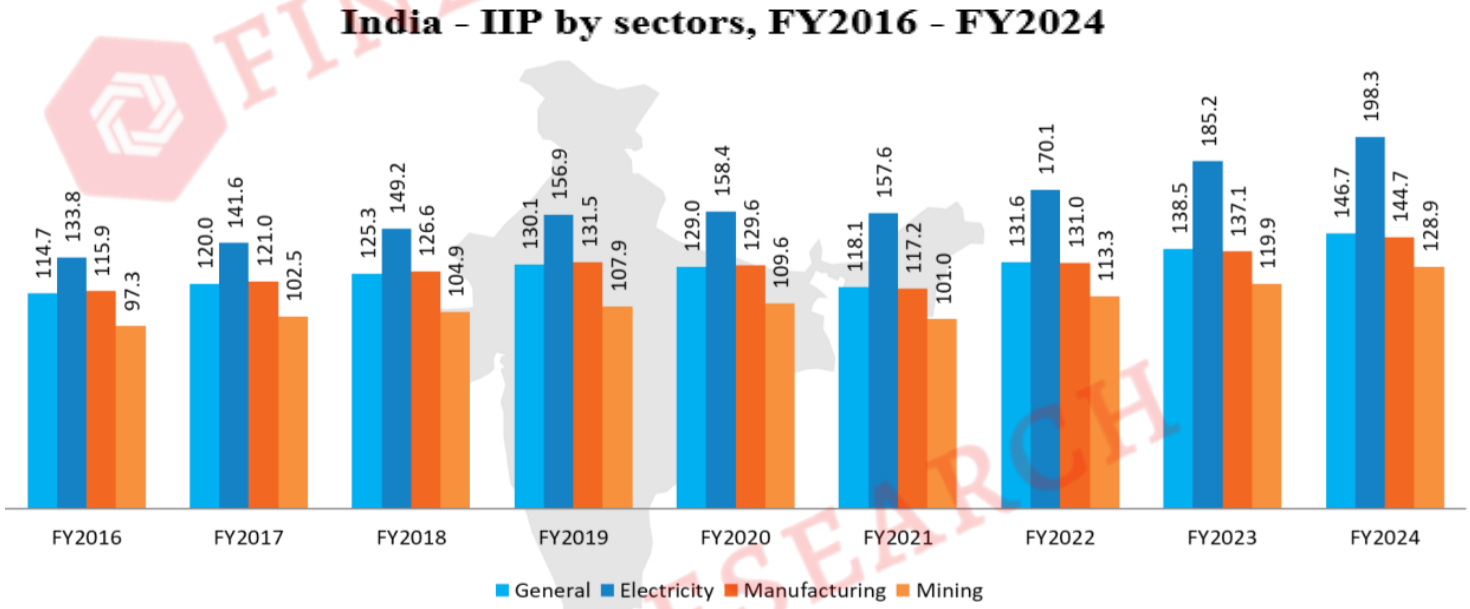
Indian Economy Outlook

India has emerged as the fastest-growing large economy over the past three years, demonstrating remarkable performance with a real GDP growth of 7.2% in FY2023 and 8.2% in FY2024. This growth trajectory has allowed India to outpace many other major economies and remain relatively insulated from global inflationary pressures.

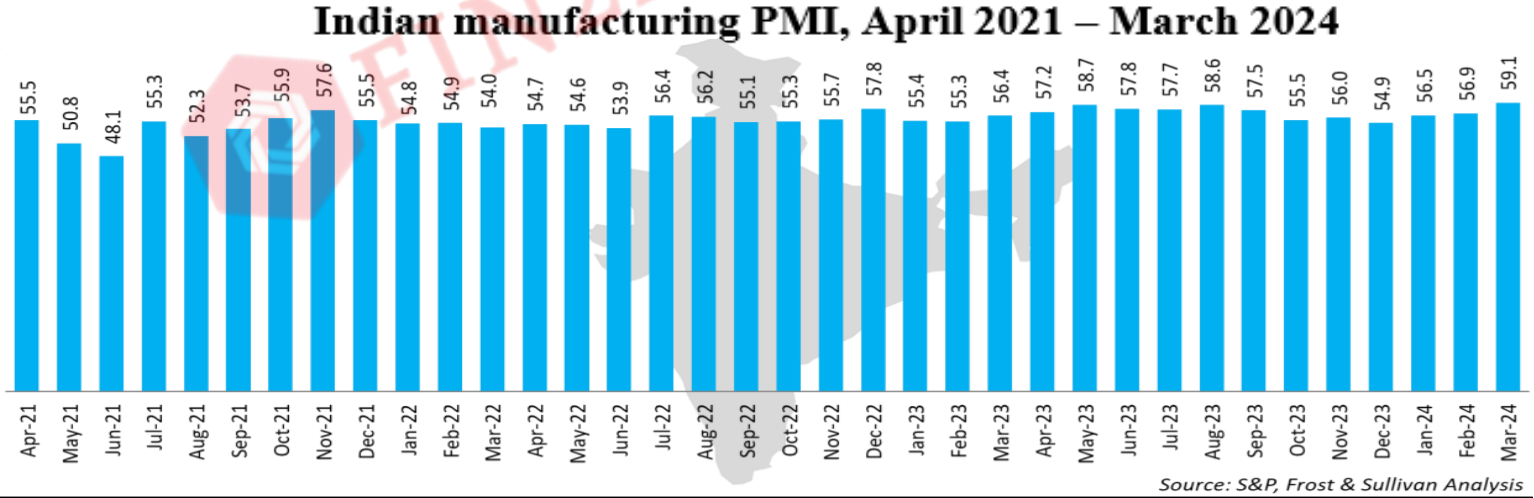
The Indian government has implemented several structural reforms aimed at strengthening the economy post-pandemic. Key initiatives include disinvestment programs, increased foreign direct investment (FDI) limits, and a national logistics policy, all designed to enhance the manufacturing sector. Additionally, the FY2025 budget has outlined nine strategic priorities in pursuit of 'Viksit Bharat,' which are: a) productivity and resilience in agriculture, b) employment and skilling, c) inclusive human resource development and social justice, d) manufacturing and services, e) urban development, f) energy security, g) infrastructure, h) innovation, research and development, and i) next-generation reforms.

In CY2019, the Indian government set an ambitious target of becoming a USD 5 trillion economy by FY2025. However, due to the disruptions caused by the COVID-19 pandemic, the timeline was revised by 18 to 24 months. Despite this, India's GDP is projected to surpass USD 4 trillion by FY2025 and is expected to reach USD 5 trillion within the subsequent 3 to 4 years, positioning it to become the third-largest economy globally, surpassing Germany and Japan.

The Index of Industrial Production (IIP) has shown stable growth since FY2022. Industrial activity began to recover from June 2021 and maintained its momentum through FY2022 and FY2024. Provisional data for FY2024 indicates a 5.5% growth in the manufacturing sector, while mining, electricity, and general industries grew by 7.5%, 7.1%, and 5.9%, respectively. This consistent performance across industrial sectors underscores India's robust economic recovery and growth.



Source: MoSPI (Annual Estimates of GDP at constant price, 2011-12 series); RBI (Reserve Bank of India); Frost & Sullivan Analysis



Source: S&P, Frost & Sullivan Analysis

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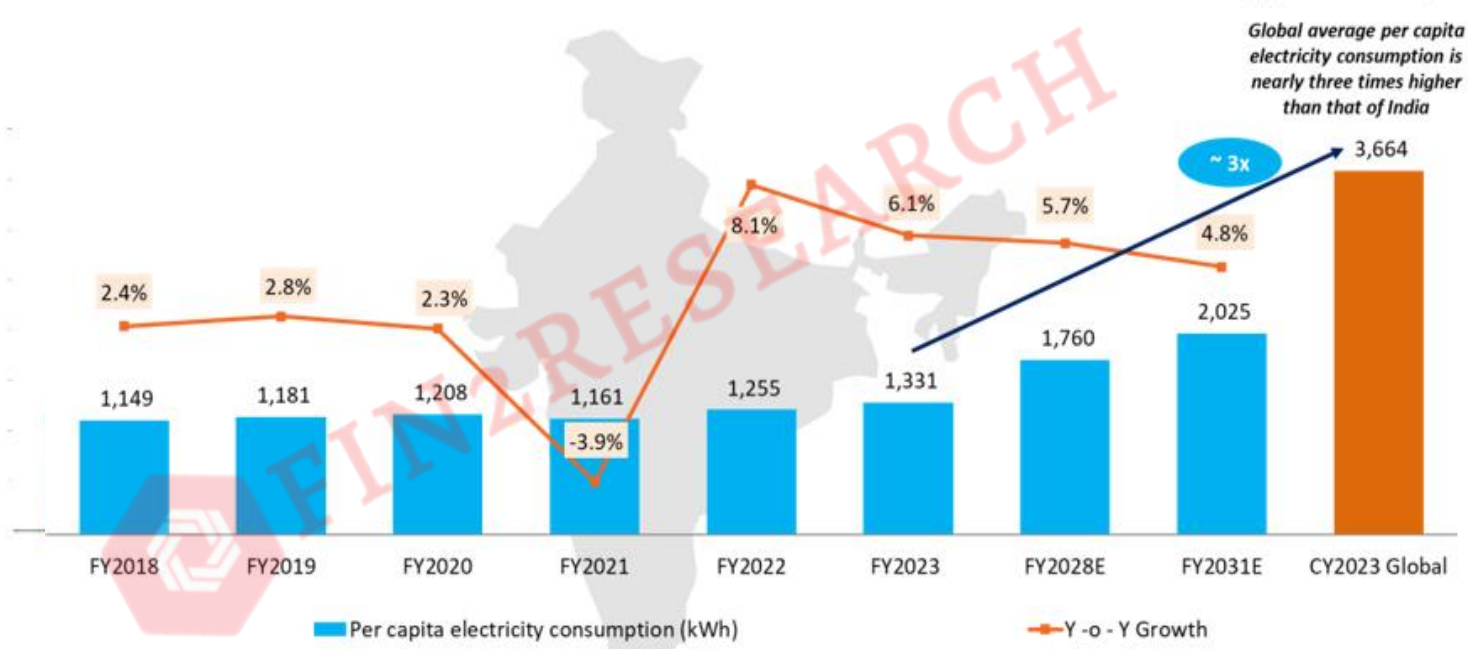
Thematic Report

India's per capita electricity consumption recorded healthy growth in the last two years and is expected to reach approximately 2,000 kWh by FY2031

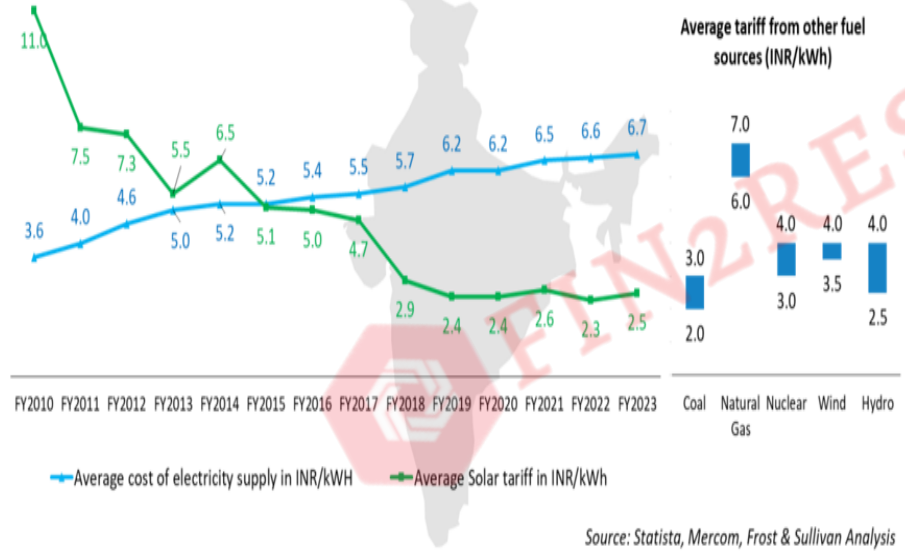
- India's per capita electricity consumption has experienced healthy growth over the past two years and is projected to continue on this upward trajectory. The consumption increased from 1,149 kWh in FY2018 to 1,331 kWh in FY2023, which is about one-third of the global average of 3,664 kWh at the end of CY2023.
- This growth reflects an annual increase of 8.1% in FY2022 and 6.1% in FY2023. Contributing factors to this rise include the electrification of rural areas, increased economic and manufacturing activities, and greater penetration of consumer durables.
- Based on a historical average multiplier of 0.8 relative to GDP growth, per capita electricity consumption in India is projected to reach approximately 1,760 kWh by FY2028 and could approach 2,025 kWh by FY2031. This trend signifies an ongoing enhancement in electricity access and consumption as the country progresses economically.

Per capita electricity consumption and growth, in kWh and %, FY2018 – FY2023



Source: Central Electricity Authority, Statista, Our World in Data, Frost & Sullivan Analysis

Average cost of electricity supply and average Solar tariff, ₹/kWh, FY2010 – FY2023



Source: Statista, Mercom, Frost & Sullivan Analysis

In India, solar energy has emerged as the most cost-effective fuel source for electricity generation. The Average Cost of Supply (ACS) for electricity, which reflects the average cost to deliver power to consumers, has risen steadily from ₹3.6 per kilowatt hour (kWh) in FY2010 to ₹6.7 per kWh in FY2023.
In contrast, the average tariff for solar power has shown a consistent decline over the same period. As solar adoption has increased, the tariff has decreased from higher levels in FY2010 to a stable range of ₹2.3 to ₹2.6 per kWh over the past five years. This trend indicates that solar tariffs are now lower than those of many thermal power plants.
This significant reduction in solar tariffs compared to traditional fuel sources highlights the growing economic viability of solar energy and suggests a promising and sustainable future for solar power in India's energy landscape.

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Thematic Report

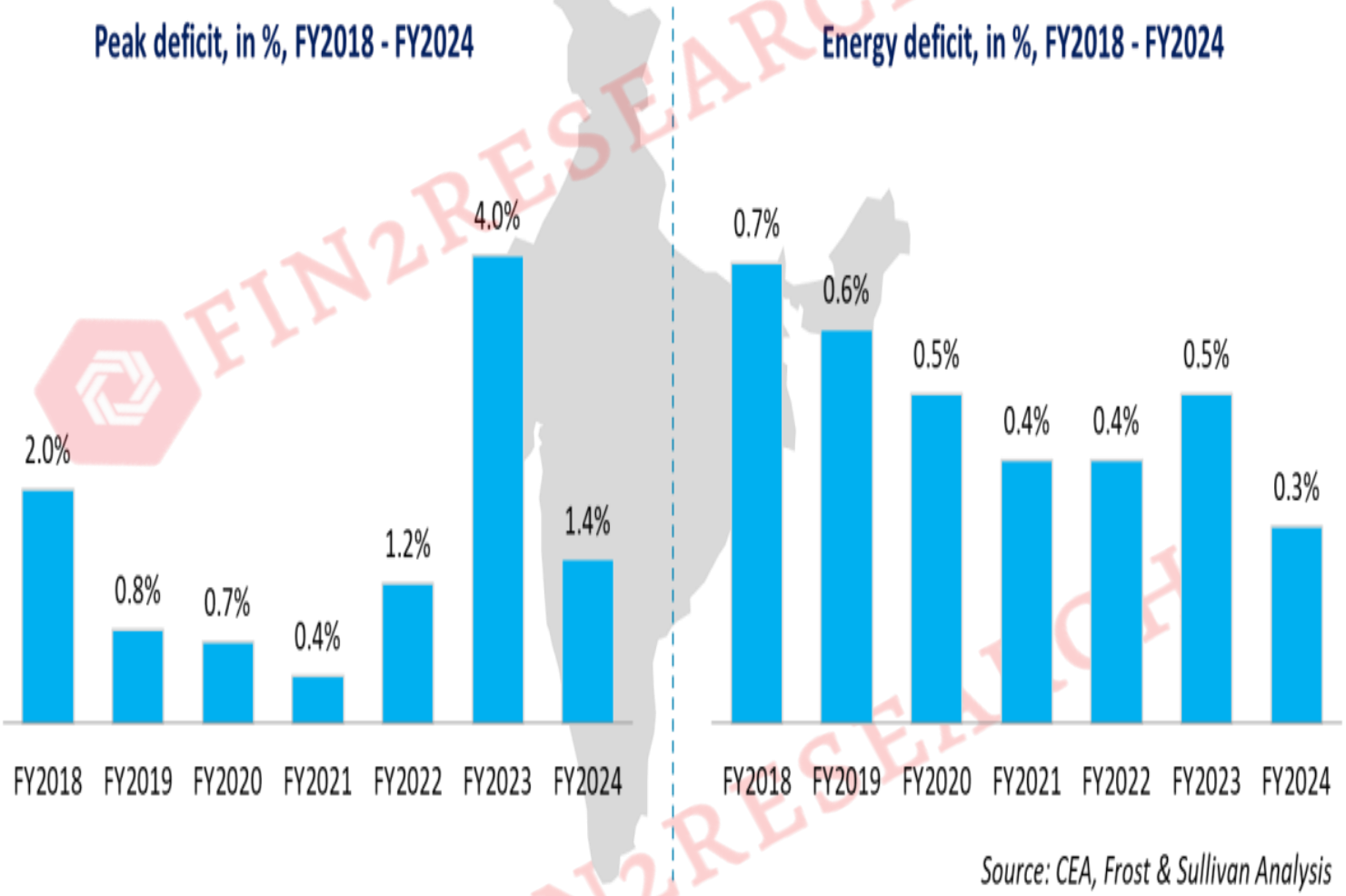
Challenges in the Indian Power Sector: A Strategic Opportunity for Solar Manufacturing

The Indian power sector has undergone significant improvements over the past decade, with peak power deficits reducing dramatically from 16.6% in FY2008 to 0.4% in FY2021. However, recent data shows a troubling rise in deficits: 1.2% in FY2022 and 4.0% in FY2023, attributed to spikes in electricity demand during monsoon months and insufficient additions to firm capacity. Despite a decrease to 1.4% in FY2024 thanks to better fuel management, the situation remains concerning.

To address these challenges and prevent future deficits, the Indian government plans substantial capacity expansions. By FY2028, an addition of approximately 88 GW of base load thermal power is planned, aimed at meeting peak demands of 295 GW. By FY2032, the goal is to have enough capacity to handle peak demands of up to 366 GW. Additionally, converting renewable energy (RE) plants to round-the-clock (RTC) operation is expected to further mitigate deficit risks.

This strategic expansion and modernization of the power sector should help stabilize supply, manage peak demand more effectively, and support continued economic growth.

Peak deficit and Energy deficit in India, in %, FY2018 – FY2024



Source: CEA, Frost & Sullivan Analysis

- The energy deficit in India has been relatively stable and low, ranging between 0.3% and 0.7% from FY2018 to FY2024. In FY2024, the country's total energy requirement was 1,626 billion units, while the power generating stations and grid were able to supply 1,622 billion units. This resulted in a modest energy deficit of around 0.25%, indicating that overall energy supply has been fairly consistent and reliable.
- The stable energy deficit, combined with strategic plans to address peak power deficits and increase capacity, suggests a robust approach to balancing both immediate and long-term energy needs. The government's efforts to enhance base load capacity and convert renewable energy sources to RTC plants should further improve reliability and reduce both peak and overall energy deficits in the future.

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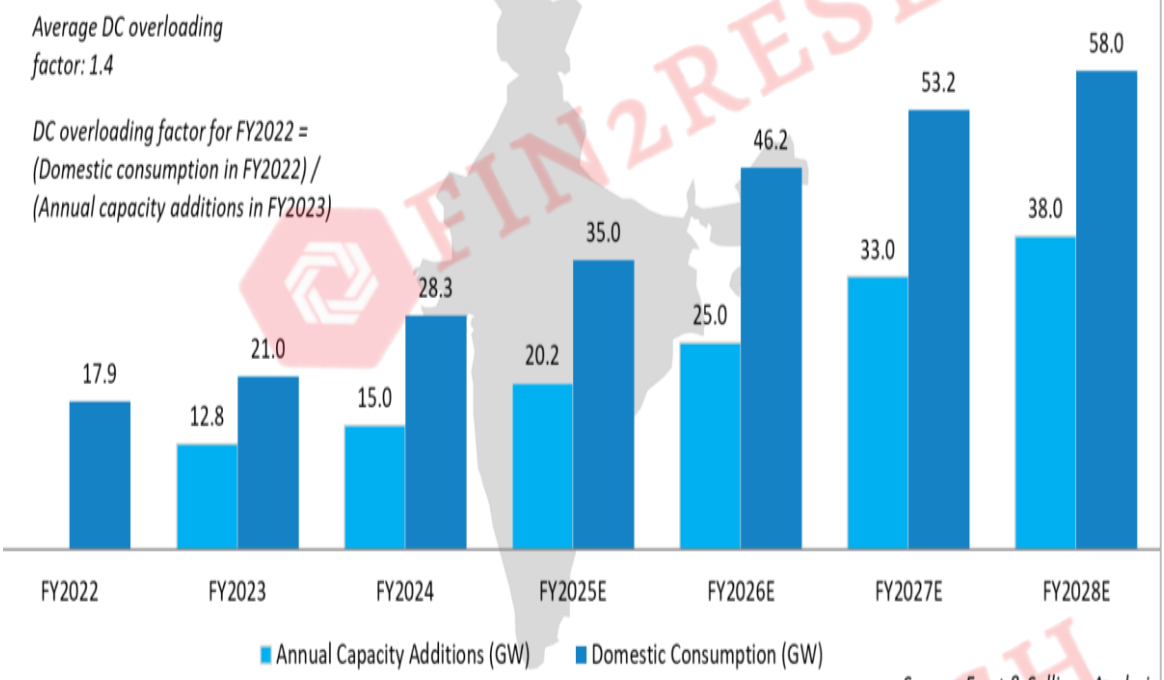
In-Depth Look at Solar Cell and Module Manufacturing

- The growing demand for solar modules and cells is expected to surpass capacity additions due to the industry's practice of DC overloading, which helps reduce the levelized cost of power (LCOE). In this approach, inverters are paired with oversized DC module capacity to boost energy generation, especially during non-peak hours when solar modules are less efficient. Since solar modules only reach peak efficiency for short periods, typically at midday, DC overloading allows plants to increase output throughout the day. Consequently, meeting domestic solar capacity targets will require significantly higher module production to keep pace with rising demand.

Solar capacity addition targets vs module requirements, GW, India, FY2022 – FY2028E



Source: Frost & Sullivan Analysis

The Indian government aims to achieve 500 GW of clean energy by CY2030, with 300 GW dedicated to solar power. To meet this target, annual solar capacity additions are expected to double in the next 2-3 years, supported by auctions for 50 GW of renewable energy, 80% of which is designated for solar projects. By FY2028, India's solar capacity is projected to reach 200 GW. To manage solar intermittency, the government is implementing battery energy storage and pumped storage plants. Additionally, DC overloading, which pairs inverters with oversized module capacity, boosts energy generation throughout the day, driving demand for more solar modules and cells.

- Supply-side measures have significantly bolstered the domestic solar module and cell manufacturing sector in India, driving the industry to new heights. By the end of FY2024, the country's solar module manufacturing capacity reached approximately 72 GW, reflecting a rapid expansion in recent years. India has emerged as a global player in the solar manufacturing space, ranking as the third-largest solar module producer worldwide, following only China and Vietnam. This progress underscores the nation's commitment to enhancing its clean energy infrastructure and reducing its reliance on imports.
- Several initiatives introduced by the Indian government, including production-linked incentive (PLI) schemes, import duties on solar equipment, and favorable policies for domestic manufacturers, have collectively provided a much-needed push to the solar sector. These supply-side measures have helped create an environment conducive to large-scale manufacturing, attracting both domestic and foreign investments. As a result, India's solar manufacturing sector is poised to support the country's ambitious renewable energy goals, which include achieving 300 GW of solar power capacity by 2030.
- The industry now boasts over 100 solar module manufacturers, with the top 10 companies commanding a significant portion of the market. By the end of FY2024, these leading manufacturers accounted for a combined production capacity of 50 GW, reflecting their dominant role in the domestic landscape. The expansion of these manufacturers is instrumental in fulfilling the increasing demand for solar modules, driven by large-scale solar power projects across the country.
- Among the top-tier manufacturers, some have made notable advancements, expanding their production capacities significantly. For instance, one of the major players in the industry has surpassed an annual installed capacity of over 4 GW, cementing its position as a key contributor to India's solar module manufacturing ecosystem. Such advancements demonstrate the sector's potential to not only meet domestic demand but also contribute to global supply chains.
- India's solar manufacturing growth has been complemented by the government's focus on improving the overall supply chain, encouraging the development of upstream and downstream industries. This includes the manufacturing of solar cells, which has seen a steady rise, supported by the government's emphasis on vertical integration within the industry. As the country continues to increase its solar manufacturing capacity, it will play a pivotal role in supporting the global transition to renewable energy sources.
- With continued government support, rising demand for clean energy, and ongoing technological advancements, the Indian solar manufacturing sector is well-positioned to remain on a robust growth trajectory. This progress will not only contribute to achieving the nation's clean energy goals

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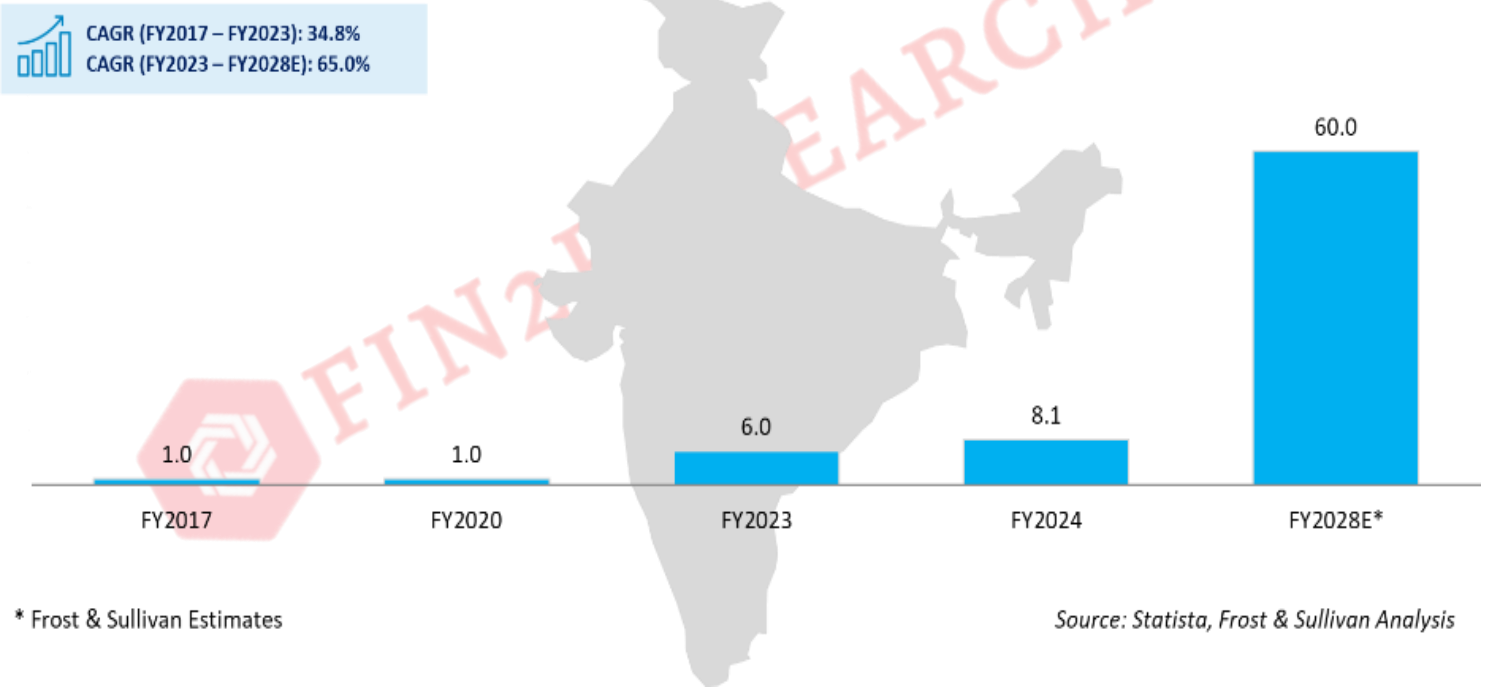
Solar cell manufacturing annual installed capacity trends, GW, India, FY2017 – FY2028E



* Frost & Sullivan Estimates

Source: Statista, Frost & Sullivan Analysis

- India's solar energy sector is experiencing notable growth, with a particular emphasis on expanding manufacturing capacity. However, a key observation is the limited number of fully integrated solar cell and module manufacturers in the country. The manufacturing of solar cells involves complex processes that require specialized expertise, contributing to the smaller number of firms engaged in this segment. High entry barriers, such as substantial capital expenditure, technical expertise, and long lead times—ranging from 15 to 18 months to establish a manufacturing line and an additional six to nine months to operationalize and stabilize—further restrict the number of new entrants.

- Among the few integrated manufacturers, some have achieved significant scale. For instance, by the end of FY2024, one of the largest integrated manufacturers in India boasts an annual installed capacity of 2.0 GW for cell manufacturing and 4.13 GW for module manufacturing. The companies holds a notable share of the integrated installed capacity in the country, highlighting the significant role played by integrated manufacturers in meeting the country's solar energy goals.

- Integrated manufacturing, which combines both cell and module production, provides several advantages. It allows manufacturers to exert greater control over module pricing and take advantage of the growing "China+1" import market strategy. Furthermore, backward integration enables access to domestic markets that require locally produced modules, offering improved cost control and better traceability of raw materials. This approach also supports international revenue streams, particularly from regions with higher margins.

- Despite the inherent risks and complexities associated with solar cell manufacturing, such as extensive utilities management and higher investment requirements, the future of this sector remains promising. The ongoing investments in integrated solar cell and module manufacturing are expected to drive further growth and innovation, reinforcing India's position in the global solar energy market.

- In terms of future outlook, the annual installed capacity for solar cell manufacturing in India is projected to see substantial growth through FY2028. This positive trend reflects the increasing importance of solar energy in the country's clean energy strategy and the sector's potential to expand significantly in the coming years.

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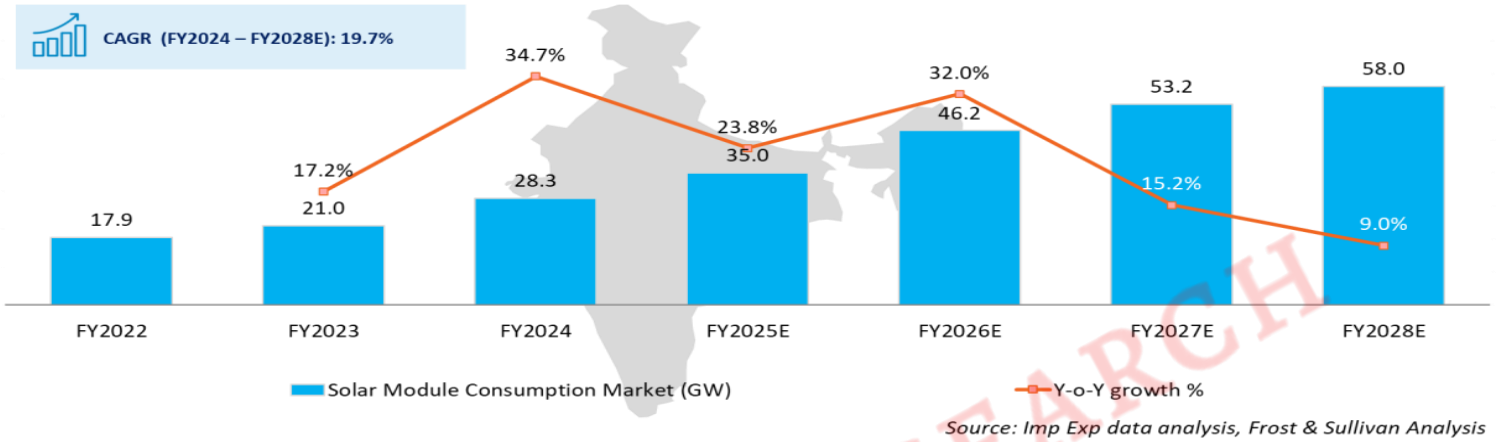
Indian solar module consumption market, GW, FY2022 – FY2028E

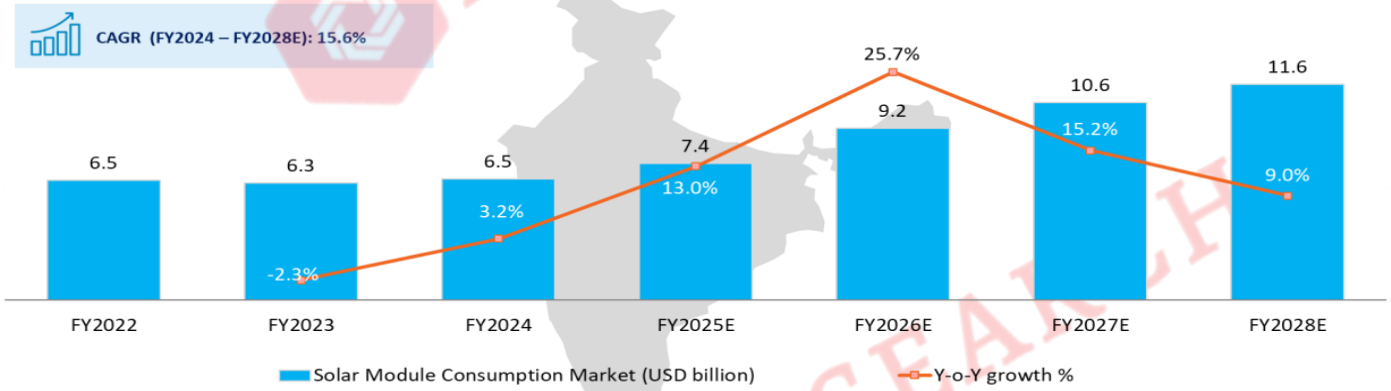


Source: Imp Exp data analysis, Frost & Sullivan Analysis

Solar Module Consumption Market = Domestic module production + Import - Export

- *Till FY2021, Solar Cells and Modules were both classified under HS Code 85414011.*
- *In FY2022, the HS Code 85414011 was retained for Solar PV Cells and a new HS Code 85414012 was brought in for Solar PV Modules.*
- *Subsequently, from FY2023, the Solar PV Cells and Solar PV Modules (other than those exclusively used with ITA-1 items) are put under HS Codes 85414200 and 85414300 respectively.*

Indian solar module consumption market, USD billion, FY2022 – FY2028E



Source: Imp Exp data analysis, Frost & Sullivan Analysis

India's solar cell consumption and export markets are both expected to experience significant changes in the coming years.

Domestic Solar Cell Consumption:

Solar cell consumption in India has grown markedly, increasing from 8.9 GW in FY2022 to approximately 22.1 GW in FY2024. This more than 100% growth in just two years highlights the rising demand for solar power. As India develops its domestic solar module production capabilities, imports of solar modules are anticipated to decline, leading to a boost in the domestic solar cell consumption market. Government initiatives such as PM Suryagrah Yojana, CPSU Scheme, and KUSUM have driven demand for Domestic Content Requirement (DCR) modules, outpacing the current 8.1 GW installed production capacity for solar cells in India. Consequently, the domestic solar cell consumption market is projected to expand approximately 3.5 times, reaching around 78 GW by FY2028.

Solar Cell Exports:

In terms of exports, solar cell exports from India have seen a significant increase in recent years. The export value of solar cells rose sharply from USD 1.1 million in FY2023 to USD 54.7 million in FY2024. The United States remains a primary destination for Indian solar cell exports, accounting for approximately 57% of these exports. This growth is partly driven by the U.S. ramping up its module manufacturing capacity, where India can capitalize on opportunities that China cannot due to trade barriers.

Overall, both the domestic consumption and export of solar cells are poised for substantial growth. As the domestic market for solar cells expands and export opportunities increase, India's position in the global solar energy sector is likely to strengthen.

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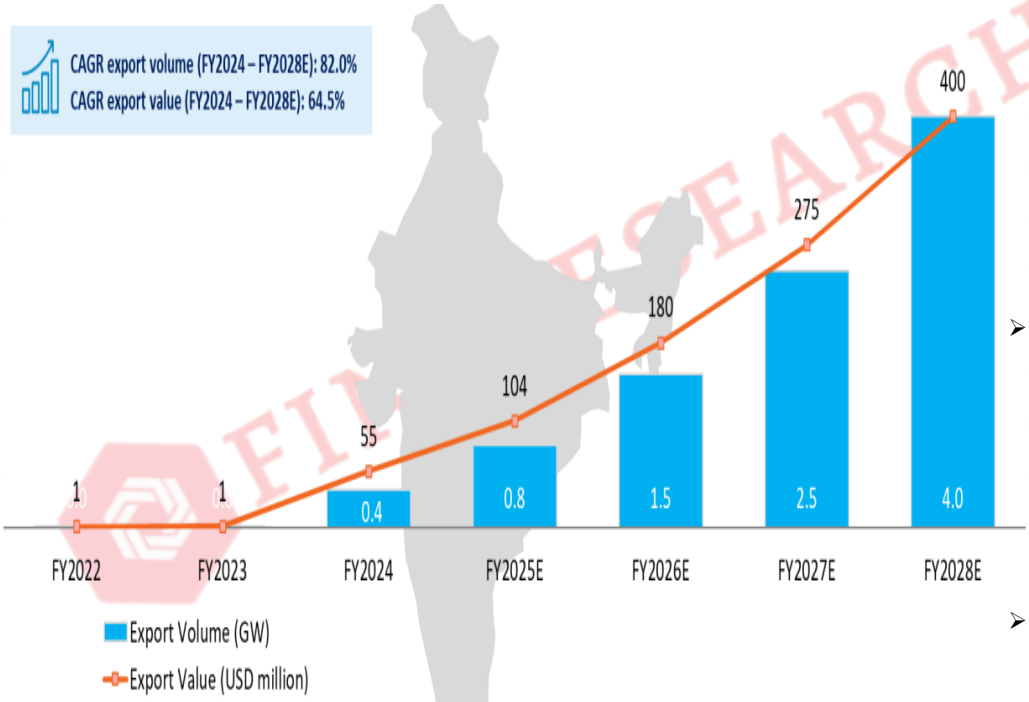
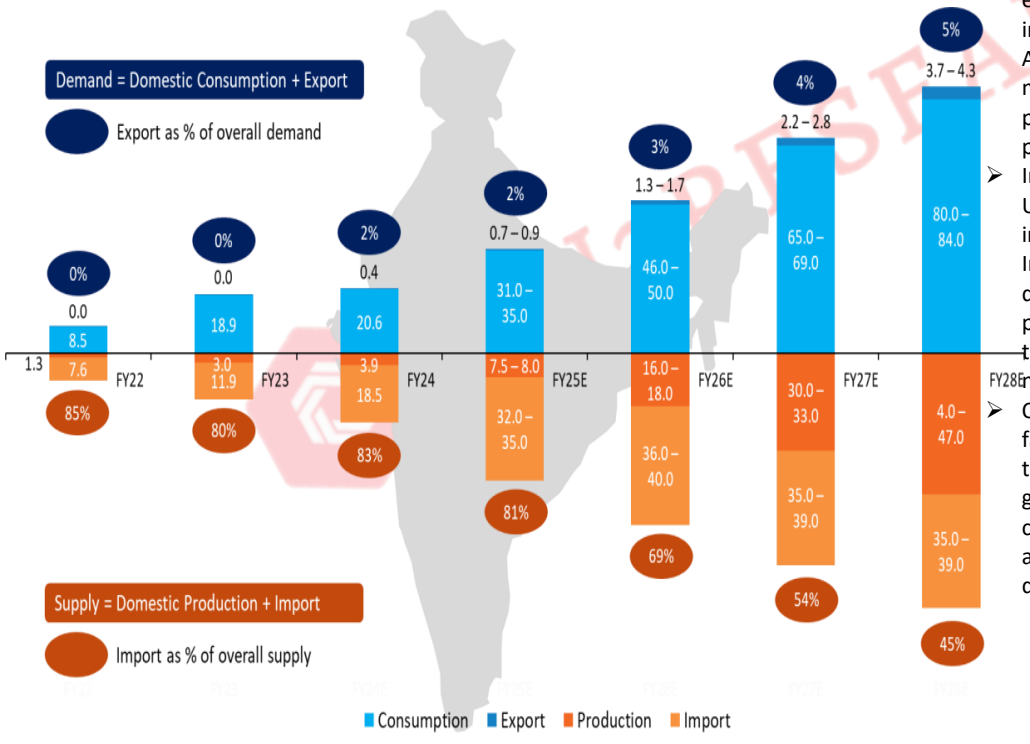
Solar Cell Import-Export Market : An Opportunities and Challenges both

Indian solar cell export market, GW and USD million, FY2022 – FY2028E



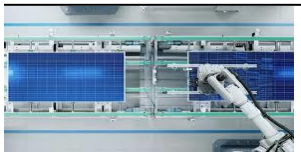
Source: Imp Exp data analysis, Frost & Sullivan Analysis

Indian solar cell demand-supply balance, GW, FY2022 – FY2028E



Source Imp Exp data analysis, Frost & Sullivan Analysis

- India's solar cell exports are projected to rise significantly in the coming years, driven by increasing global demand and strategic opportunities. Although solar cell exports have historically lagged behind module exports in value terms, there has been a notable surge recently. In FY2023, solar cell exports were valued at USD 1.1 million, but this figure leaped to USD 54.7 million in FY2024. Approximately 57% of these exports were directed to the U.S. market, which remains a key destination for Indian solar products, particularly where Chinese products face trade barriers.
- The trend of rising solar cell exports is expected to continue, with forecasts suggesting growth to USD 400 million by FY2028. In volume terms, solar cell exports are anticipated to expand from 0.4 GW in FY2024 to 4.0 GW by FY2028. This growth is partly fueled by the China Plus-One strategy, which has created opportunities for Indian manufacturers by diversifying supply chains and reducing reliance on Chinese suppliers.
- However, the outlook for Indian solar cell exports to the U.S. is contingent upon several factors. The U.S. Department of Commerce's final determination on the imposition of duties related to products assembled outside China using Chinese components could impact the competitiveness of Indian solar cells in the U.S. market. If countervailing duties are not enforced, competition for Indian products may increase. Additionally, the Inflation Reduction Act (IRA) in the U.S. aims to boost local manufacturing of solar cells and modules, potentially affecting demand for Indian products.
- In Europe, the implementation of the European Union's Carbon Border Adjustment Mechanism in 2025 may open up new opportunities for Indian solar cell exports. This mechanism is designed to reduce global carbon emissions and prevent "carbon leakage," potentially making the European market more accessible for Indian manufacturers.
- Overall, while the Indian solar cell export sector faces some uncertainties due to evolving global trade policies and regulatory changes, the growth trajectory remains promising as India continues to leverage its competitive advantages and adapt to global market dynamics.



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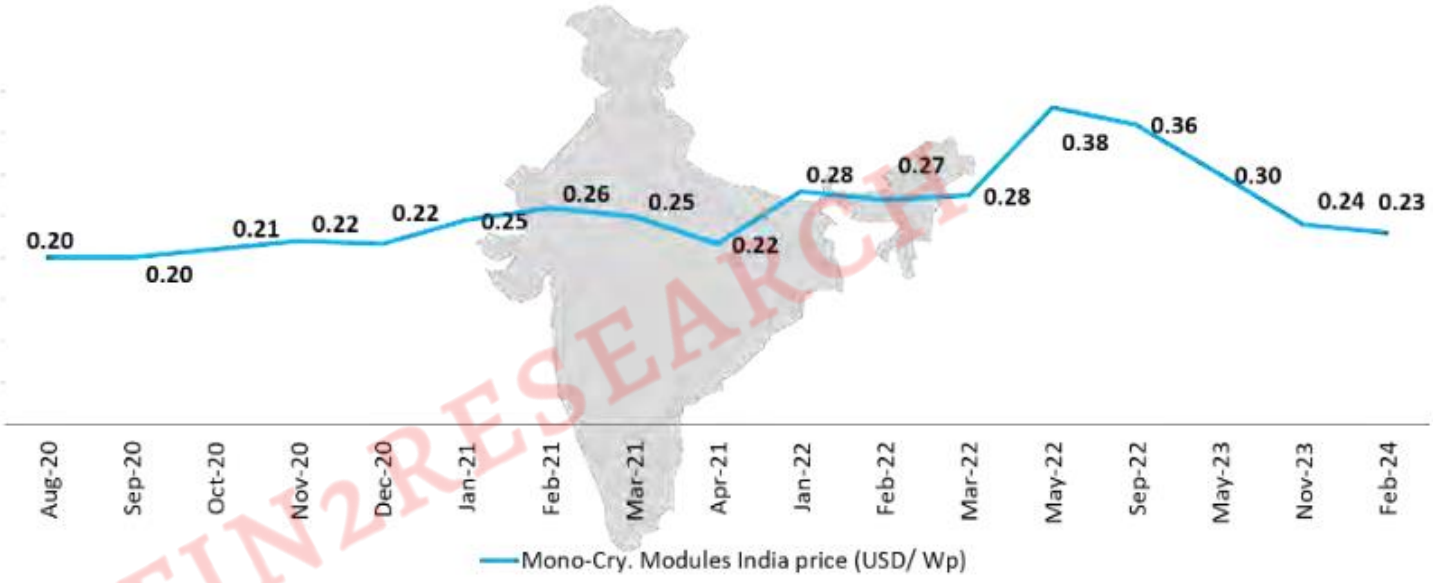
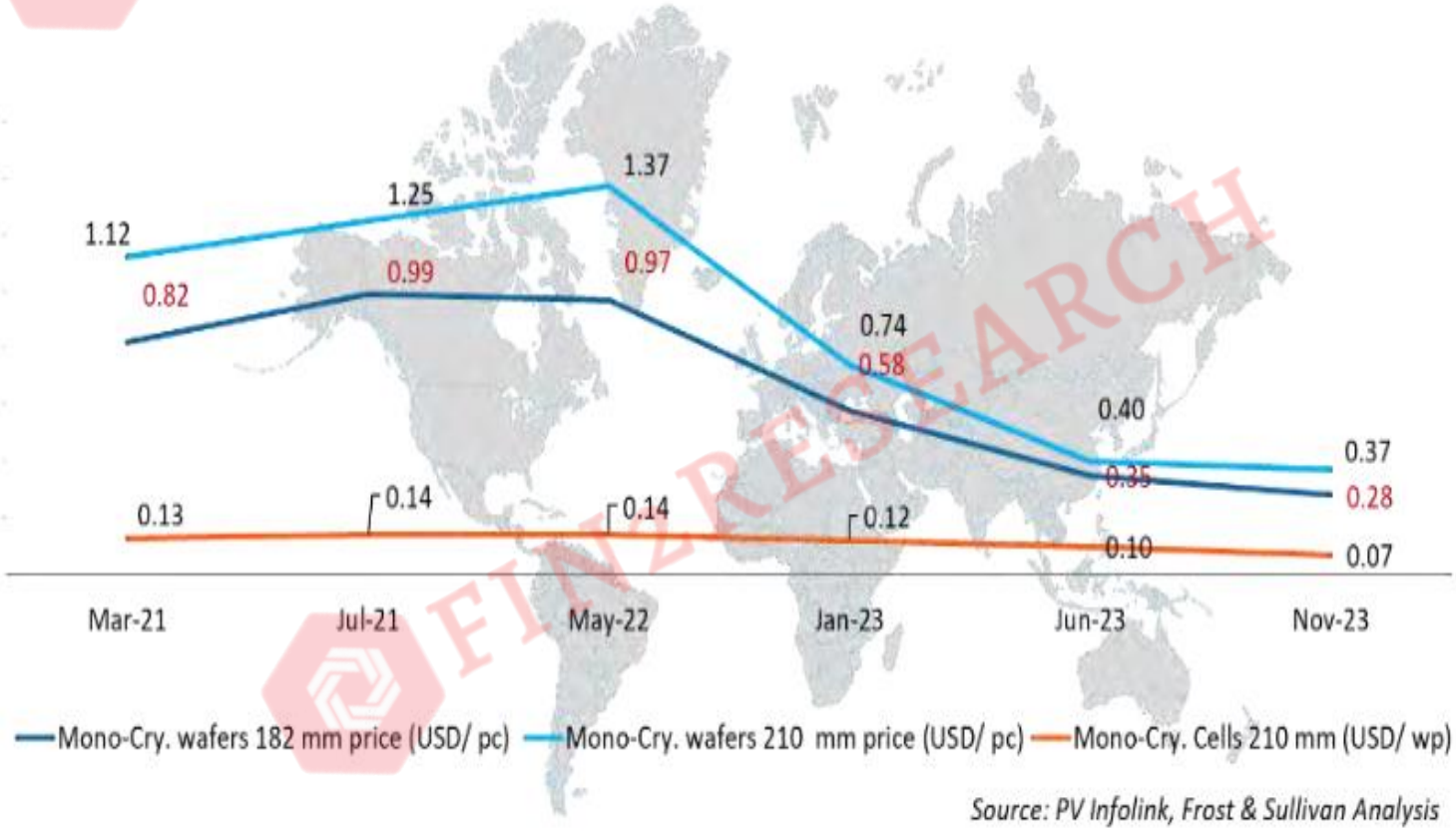
Solar Module and Cell : Price Trends

Solar module price trends, India, August 2020 – Feb 2024



Source: PV Infolink, Frost & Sullivan Analysis

Solar cell and wafer price trends, Global, March 2021 – November 2023



Source: PV Infolink, Frost & Sullivan Analysis

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Solar module and cell prices in India have exhibited significant fluctuations in recent years, heavily influenced by global market dynamics, particularly the price of **polysilicon**, a critical raw material in photovoltaic (PV) manufacturing.

Polysilicon Price Surge and Its Impact:

Polysilicon prices remained relatively stable until **July 2020**, when they began rising dramatically, increasing from **$6.8/Kg** to **$43/Kg** by **November 2021**—a nearly six-fold jump. This sharp rise was partly triggered by an energy crisis in countries like **China**, the largest global supplier of solar manufacturing components. The shortage of coal and disruptions in the supply chain led to rolling blackouts, particularly in energy-intensive industries like solar manufacturing, exacerbating the already difficult situation. As a result, solar module prices saw a temporary increase during this period due to supply shortages.

Price Trends from August 2020 to February 2024:

During **FY2024**, a notable reversal occurred in module prices, driven by an **oversupply** of upstream components, particularly polysilicon, leading to a significant reduction in prices. By the last few months of **FY2024**, solar module prices in India had dropped to around **$0.23 per watt-peak (Wp)**, a considerable decline from **$0.30 per Wp** seen earlier. This drop was primarily due to the nation's reliance on imported cells and the global surplus of materials.

Domestically produced solar modules in India have followed a similar downward trajectory, although they remain **45-50% more expensive than Chinese products**. This price disparity can be attributed to factors such as the **27.5% import duty on solar cells**, the higher cost of local manufacturing, and India's current manufacturing infrastructure, which is still developing in comparison to China.

Wafer Price Trends:

The price of **silicon wafers**, another essential component in solar cells, has also declined due to excess production capacity and rapid advancements in cell technology. In **2023**, wafer prices fluctuated, creating intense competition in the market. Supply for silicon wafers, especially for **p-type wafers**, has outpaced demand, leading manufacturers to sell these products at prices below production costs. This has put pressure on wafer manufacturers, with some considering cutting back production to balance supply with demand. While this could lead to price increases in the future, wafer prices are currently experiencing further declines.

N-type wafers have also seen a drop in price, with expectations of further reductions. As technological advancements continue to push the efficiency of solar modules, the cost pressures on raw materials like wafers are expected to remain a key driver in shaping the future price trends of solar modules and cells.

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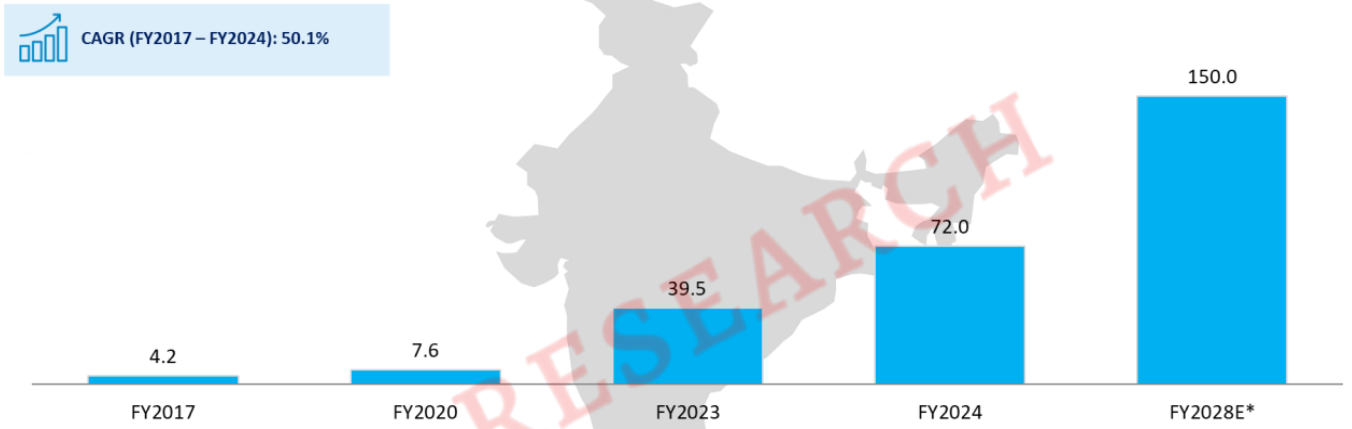
India's FY2024 Solar Module & Cell Capacity by Company in GW and % share

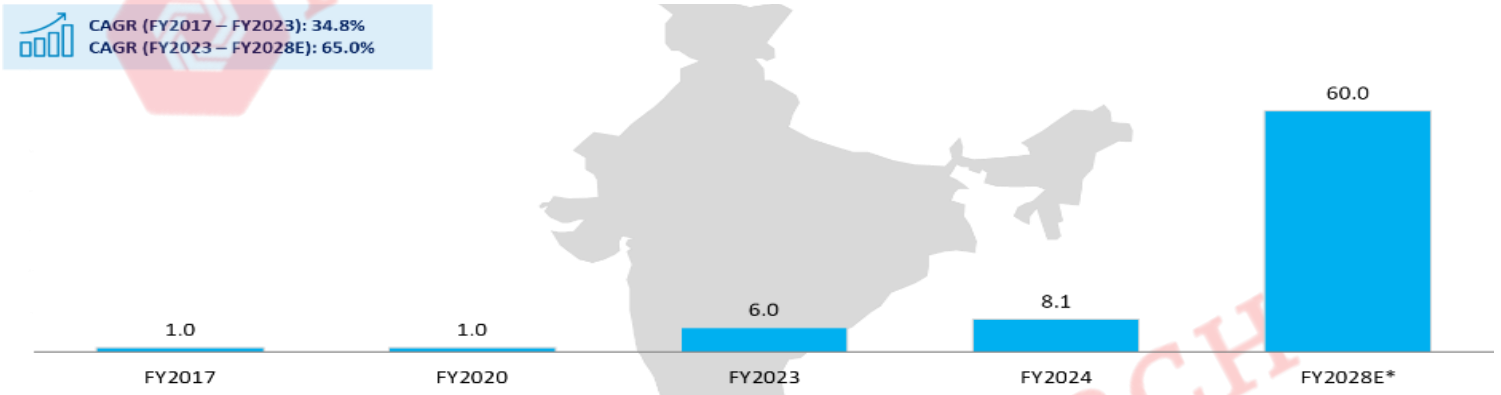
Solar module manufacturing installed capacity trends, GW, India, FY2017 – FY2028E



* Based on discussions with industry experts and other published estomates

Source: Statista, Frost & Sullivan Analysis

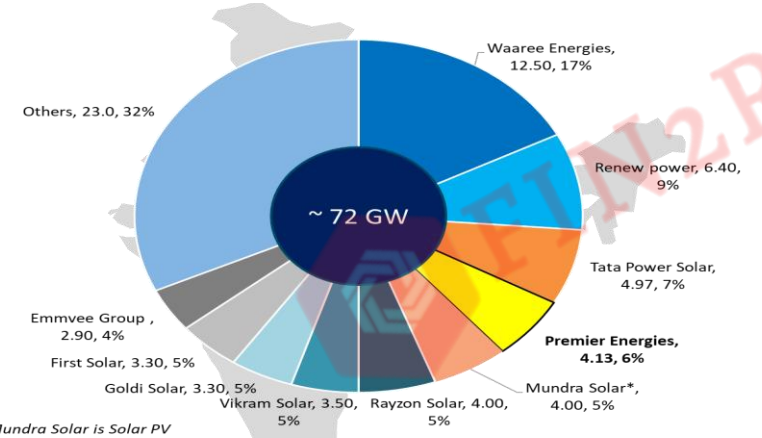
Solar cell manufacturing annual installed capacity trends, GW, India, FY2017 – FY2028E



* Frost & Sullivan Estimates

Source: Statista, Frost & Sullivan Analysis

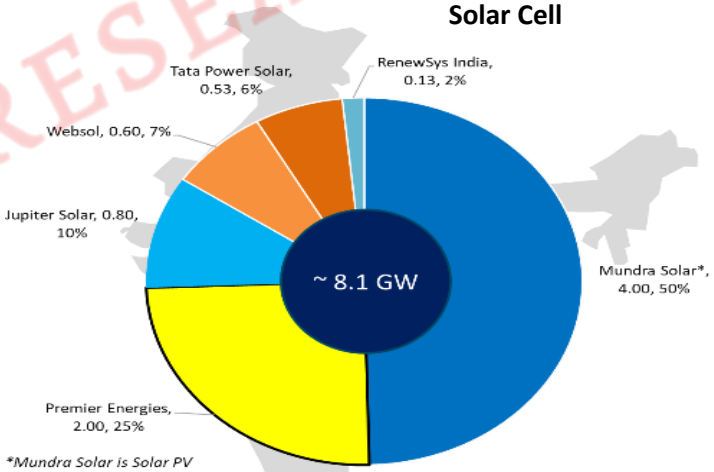
Solar Module



*Mundra Solar is Solar PV Module and Cell manufacturing company of Adani Group

Source: AISMA, MNRE, Primary Research, Frost & Sullivan Analysis

Solar Cell



*Mundra Solar is Solar PV Module and Cell manufacturing company of Adani Group

Source: AISMA, MNRE, Primary Research, Frost & Sullivan Analysis

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Revelations That Emerge

What is India's Clean Energy Target for 2030, and How Much is Dedicated to Solar Power?
India has set an ambitious clean energy target of **500 gigawatts (GW)** by 2030, with **300 GW** specifically allocated to solar power. This significant dedication underscores the country's strong focus on renewable energy, particularly solar, as a pivotal component of its sustainability objectives.

What Initiatives is the Indian Government Taking to Achieve Its Solar Capacity Targets?
To meet its solar capacity goals, the **Ministry of New and Renewable Energy (MNRE)** has rolled out key initiatives, including **annual auctions** aimed at adding **50 GW of renewable energy capacity** each year. Notably, **80% of this capacity is reserved for solar projects**. These programs are expected to **double India's annual solar capacity** in the next two to three years.

What Are the Expected Solar Capacity Outcomes by FY2028?
As a result of these proactive initiatives, India's installed solar capacity is projected to reach **200 GW by FY2028**. This expansion will significantly advance the nation toward its **2030 clean energy target of 300 GW** from solar power.

How is the Indian Government Addressing the Intermittency of Solar Power?
To manage the intermittency challenges of solar energy, the government is deploying **battery energy storage systems** and **pumped storage plants**. These solutions aim to ensure **round-the-clock solar power availability** by enhancing the stability and reliability of the country's renewable energy infrastructure.

What is Driving the Growing Demand for Solar Modules and Cells in India?
The increasing demand for solar modules and cells is largely driven by the industry's use of **DC overloading**, which helps lower the **levelized cost of energy (LCOE)**. By pairing inverters with **oversized DC module capacity**, solar plants can generate more energy during non-peak hours, thus improving overall efficiency.

How Does DC Overloading Improve Solar Plant Performance?
DC overloading maximizes energy generation by enabling solar plants to produce more power throughout the day, especially during non-peak periods when solar modules are less efficient. Since solar modules reach **peak efficiency only for a short period**, typically around midday, DC overloading ensures more **consistent energy output** over a longer time frame.

What is the Implication of DC Overloading for India's Solar Capacity Targets?
The practice of DC overloading is expected to cause **solar module demand to surpass actual capacity additions**. As a result, achieving India's domestic solar capacity targets will require a **higher production of solar modules** to meet the rising industry demand.

What Opportunities are Emerging for Indian Solar Cell Manufacturers in the US Market?
With limited domestic production, the US relies heavily on overseas suppliers to meet its growing demand for solar cells, creating a significant opportunity for **Indian solar cell manufacturers**. Factors driving this opportunity include:
US regulations like the **Inflation Reduction Act (IRA)**, which incentivizes domestic solar panel manufacturing, increasing demand for solar cells.
Anti-Dumping Duties on Chinese imports, making Indian cells a **more attractive option** for US companies.
Compliance with the **Uyghur Forced Labor Prevention Act (UFLPA)**, encouraging US businesses to partner with Indian manufacturers for **ethical sourcing** and traceability.

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Top Solar Stocks to invest in 2024

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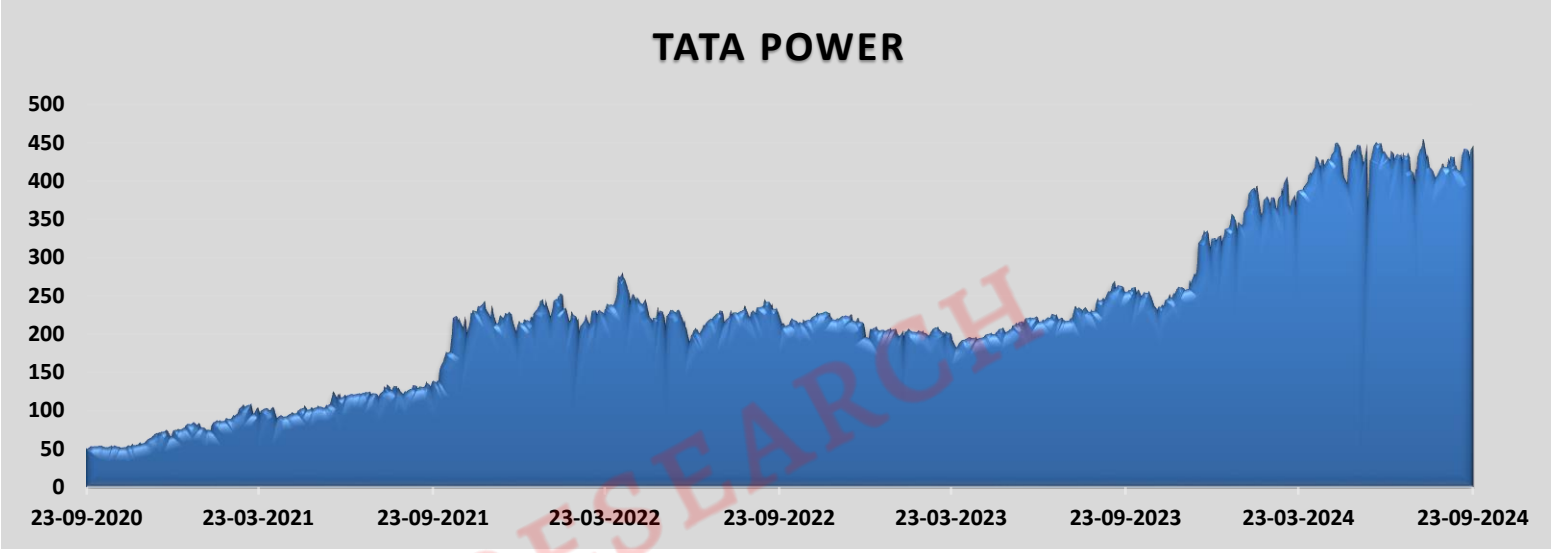
Tata Power — Direct play

BUY RANGE: @ 477-450 | **TARGET : @ 600** | **RATING : BUY**



(In cr)

Stock Info	Amount
Mkt Cap(cr)	1,39,444.62
52-weeks high	471.00
52-weeks low	230.00
No. of eq shares(cr)	319.83
Face Value	1.00
Bse Code	500400
Nse Code	Tatapower
Free Float Mcap(cr)	73897.00

Source : BSE,NSE

Particulars	ShareHolding
Promoter Holding	46.86%
DIIs Holding	15.49%
FIIs Holding	9.50%
Public	27.81%
Total	**100.00%**

Source : BSE,NSE

Particulars	FY2023	FY2024
ROCE	12%	11%
ROE	13%	12%
ROA	3%	3%
Current Ratio	0.7	0.7
Quick Ratio	0.6	0.6
Cash Ratio	0.1	0.1
EPS	10.2	7.0

Source : Company Research

Source : Company Report

About:

The company, part of the Tata Group, is a major player in India's electricity generation, distribution, and transmission, with a total capacity of approximately 14,707 MW across various sources, including thermal, hydro, wind, and solar. It supplies power in the Mumbai license area and manages projects nationwide, holding distribution licenses in Delhi and Odisha. The company also engages in power transmission, solar EPC, and power trading, while maintaining investments in coal mining in Indonesia. Additionally, it has stakes in international hydropower projects and recently secured new power transmission projects, solidifying its position in the energy sector.

Key Highlights:

- The financials for the quarter were robust, with significant progress in renewable projects.
- The company reported another strong quarter, marking the 19th consecutive quarter of increased capacity.
- The company's rooftop solar installations have exceeded 100,000, and it is well-positioned to lead in the government's goal of installing one crore units in the coming years.
- The 4-gigawatt cell and module plant, commissioned last year, is operating at full capacity, with the cell plant set to begin production shortly.
- The company also finalized a major hydro plant project in Bhutan, with operations expected to start later this year. An investment of INR 6,900 crores will be made, with 40% equity in the project.
- The balance sheet remains strong, with net debt to EBITDA less than 3x and net debt to equity less than 1.1x. The company's credit rating was recently upgraded, which will contribute to lower financing costs and improved profitability.
- The company has already invested INR 4,000 crores in capital expenditures, with 60% allocated to renewables. A plan for INR 20,000 crores of investment this year is on track. Transmission and distribution projects are progressing well, with new projects expected to become operational by FY'26.

RISK:

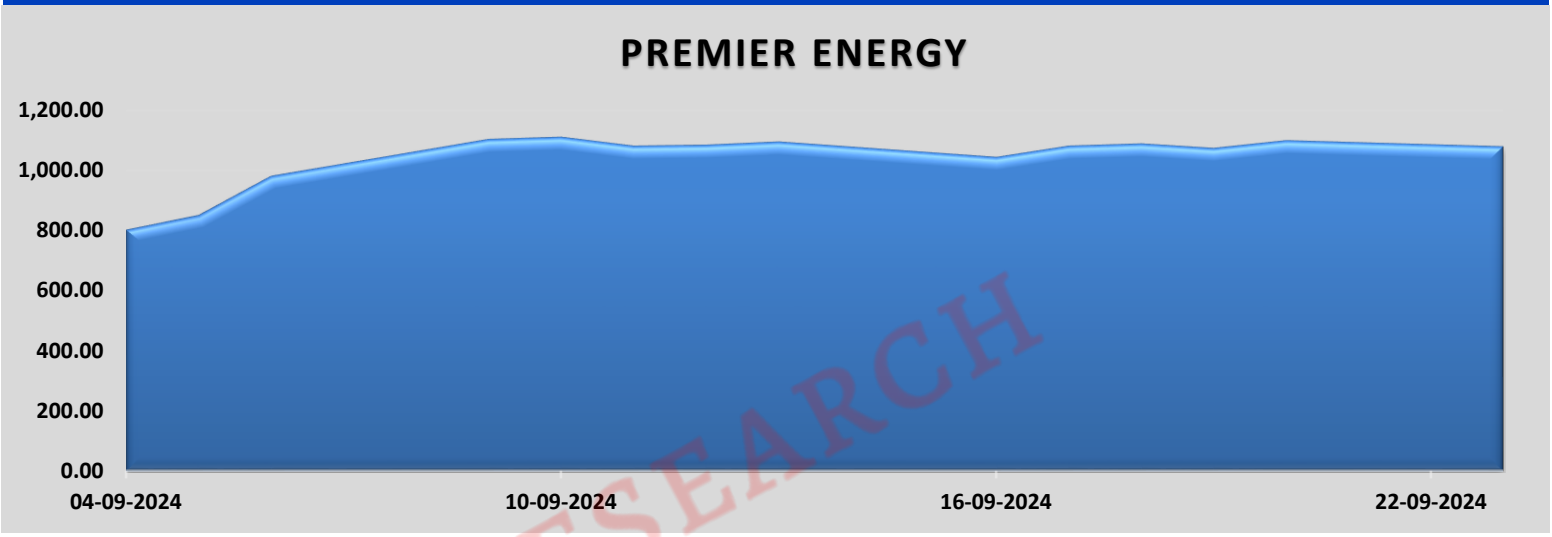
- **Moderate Leverage and Capex**
  The company has a net debt to EBITDA ratio of 3.5 times and plans ₹15,000 crore in capex for FY2025, facing execution challenges and price fluctuations.
- **Mundra Tariff Losses**
  The Mundra UMPP suffers from fuel cost mismatches, impacting profitability despite negotiations for a compensatory tariff.

FIN2RESEARCH Investment Advisor Pvt. Ltd.

Thematic Report

Premier Energies	Direct play

BUY RANGE: @ 1050-1030	TARGET : @ 1350	RATING : BUY



(In cr)

Stock Info	Amount
Mkt Cap(cr)	50,396.00
52-weeks high	1267.00
52-weeks low	802.00
No. of eq shares(cr)	42.20
Face Value	1.00
Bse Code	533100
Nse Code	PREMIERENE
Free Float Mcap(cr)	5040.00

Source : BSE,NSE

Particulars	ShareHolding
Promoter Holding	64.25%
DIIs Holding	4.76%
FIIs Holding	3.39%
Public	26.72%
Total	**100.00%**

Source : BSE,NSE

Particulars	FY2023	FY2024
ROCE	26%	6%
ROE	44%	-3%
ROI	0.3%	3.1%
Net Profit Ratio	7.4%	-0.1%
Debt/Equity	2.18	0.86
Current Ratio	1.1	1.0
EPS	6.9	-0.4

Source : Company Report

Source : Company Report

About:

Premier Energies with 29 years of expertise in the solar industry, operates as an integrated solar cell and module manufacturer. Its core activities include the production of bifacial monocrystalline PERC cells using M10 wafer size (182mm x 182mm) for module assembly. It manufactures solar modules using various technologies like monocrystalline PERC and TOPCon, offering customized solutions for specific applications. Additionally, the company engages in EPC projects, providing comprehensive solar services for ground-mounted, rooftop, floating, and hybrid systems, along with O&M services for executed projects. It also owns a 2 MW solar power plant in Jharkhand.

Key Highlights:

Financial Performance Highlights for FY 2024

- **Revenue from Operations**: The company achieved an impressive growth, with revenue reaching ₹3,143.79 crore in FY 2024, a significant rise compared to ₹1,428.53 crore in FY 2023, demonstrating strong market demand and strategic execution.
- **EBITDA**: Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) saw a remarkable improvement, rising to ₹505.32 crore in FY 2024, compared to ₹112.88 crore in FY 2023. This indicates effective cost management and operational efficiency.
- **EBITDA Margin**: The EBITDA margin increased to **15.93%** in FY 2024, up from **7.71%** in FY 2023, showcasing the company's enhanced capability in converting revenue into profit.
- **Profit After Tax (PAT)**: The company recorded a PAT of ₹231.36 crore in FY 2024, a turnaround from the loss of ₹-13.34 crore in FY 2023, indicating a strong recovery in profitability.

Key Risk:

- **Decline in Solar Module Production and Capacity**
  The company saw a drop in solar module production over the last three fiscal years, with Unit I becoming obsolete and production shifting to Units II and III. Future declines could impact operations if not effectively managed.
- **Dependency on Solar Cells and Modules**
  Solar cells and modules are critical to the company's revenue, making up 86.80% and 64.32% in FY2024. Any market or technological shifts could disrupt the company's financial stability.
- **Geographical Concentration Risks**
  All manufacturing is concentrated in Hyderabad, Telangana, exposing the company to regional risks that could disrupt production and impact its business.

Adani Enterprises Limited

FIN2RESEARCH Investment Advisor Pvt. Ltd.

Thematic Report

Adani Enterprises — Indirect play

BUY RANGE: @ 3116-3100 | **TARGET : @ 4145** | **RATING : BUY**

(In cr)

Stock Info	Amount
Mkt Cap(cr)	3,42,621.00
52-weeks high	3743.00
52-weeks low	2142.00
No. of eq shares(cr)	118.20
Face Value	1.00
Bse Code	512599
Nse Code	ADANIENT
Free Float Mcap(cr)	78792.00

Source : BSE,NSE

Particulars	ShareHolding
Promoter Holding	74.72%
DIIs Holding	6.02%
FIIs Holding	11.73%
Public	7.53%
Total	**100.00%**

Source : BSE,NSE

Particulars	FY2023	FY2024
ROCE	8.07`%	8%
ROE	9%	9%
ROA	2%	2%
Current Ratio	0.8	0.8
Quick Ratio	0.7	0.6
Cash Ratio	0.1	0.1
EPS	27.2	21.8

Source : Company Research

Source : Company Report

Adani Enterprises Limited (AEL) is a cornerstone of India's infrastructure and energy sectors, renowned for successfully incubating transformative businesses and unlocking substantial value for shareholders. AEL has cultivated several industry giants demonstrating its strength in nurturing businesses that later become self-sustaining and highly profitable. Among these ventures, Adani Solar, a vital arm of Adani New Industries Ltd (ANIL), is playing a critical role in shaping India's renewable energy future.

Adani Solar has established itself as India's first and largest vertically integrated solar photovoltaic (PV) manufacturer, focusing on both solar cells and modules. With a milestone achievement of launching India's first large-sized monocrystalline silicon ingot, It is set to drive the photovoltaic crystalline silicon industry forward. The company's backward integration strategy, where it rapidly completed an ingot line infrastructure in a record seven months, further cements its leadership in solar manufacturing. This success has positioned company as the only Indian manufacturer producing large-sized monocrystalline silicon ingots, with plans to scale up to 10 GW of manufacturing capacity by 2025.

The achievements go beyond technological advancements. Its fully integrated solar ecosystem at the Mundra facility, which includes the entire PV value chain from metallurgical-grade silicon to complete modules, aligns with India's broader goal of achieving energy self-reliance. Adani Solar's dedication to innovation and its track record of being the only Indian company ranked as a top performer by Kiwa PVEL for seven consecutive years reflect its consistent excellence. Furthermore, with over 10 GW of modules shipped both in India and the USA, Adani Solar has gained global recognition as a trusted provider of solar solutions.

The future of Adani Solar offers immense growth potential. The company is rapidly scaling its capacity, with plans to add 2 GW of ingot and wafer capacity by the end of 2023 and a goal to reach 10 GW by 2025. These expansions will significantly enhance the company's ability to meet growing global demand for renewable energy solutions. Adani Solar's ability to innovate and its leadership in the Indian market make it a strategic player in the renewable energy landscape.

Adani Enterprises, through its incubation of Adani Solar, provides investors with a unique opportunity to tap into the fast-growing renewable energy sector. With a strong focus on vertical integration and future-proof technology, Adani Solar is set to lead India's energy transition. The company's comprehensive solar manufacturing ecosystem at Mundra, its technological advancements, and its strategic importance in the green energy space position it as a key player in driving India's clean energy future. For investors, this presents a compelling valuation narrative, as Adani Enterprises continues to generate value through its dynamic and innovative portfolio.

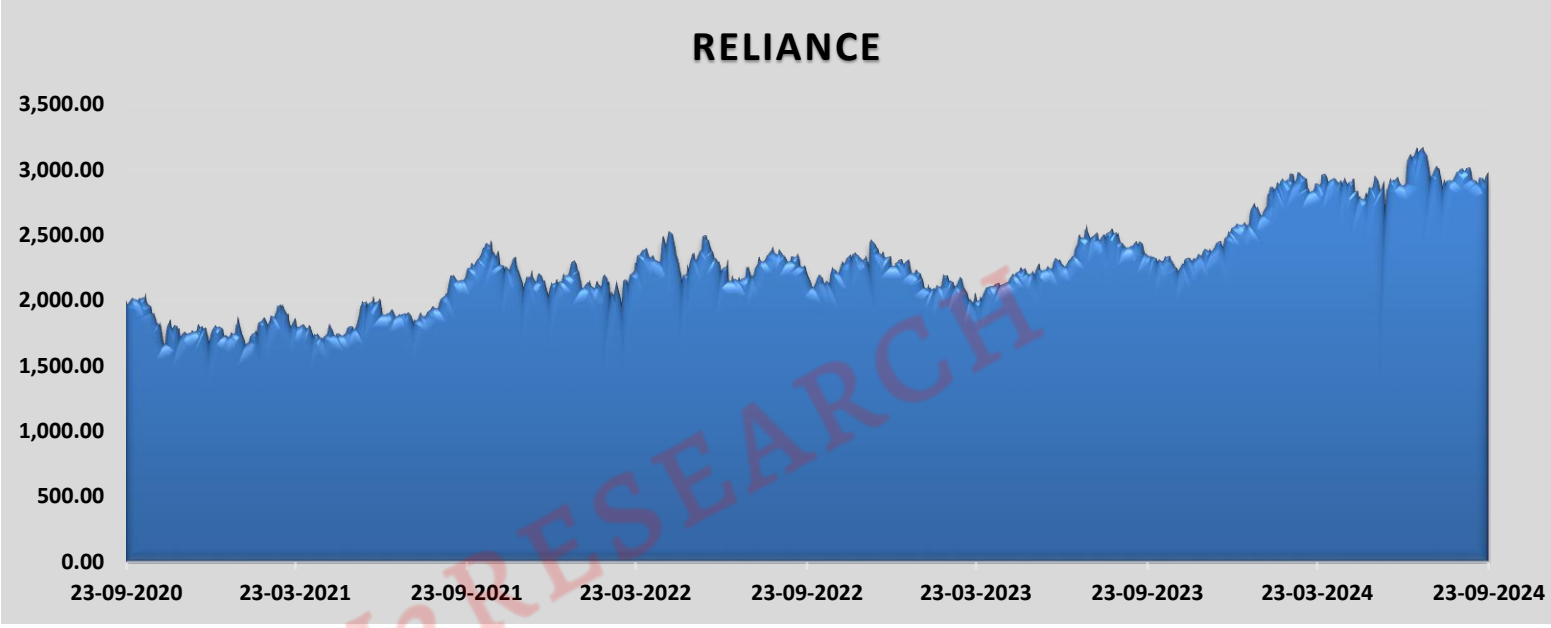
Reliance Industries Limited

FIN2RESEARCH Investment Advisor Pvt. Ltd.

Thematic Report

Reliance Industries — Indirect play

BUY RANGE: @ 2985-2950 | **TARGET : @ 3550** | **RATING : BUY**



Stock Info	Amount
Mkt Cap(cr)	20,18,919.00
52-weeks high	3217.00
52-weeks low	2220.00
No. of eq shares(cr)	676.70
Face Value	10.00
Bse Code	500325
Nse Code	RELIANCE
Free Float Mcap(cr)	1009510.00

Source : BSE,NSE

Particulars	ShareHolding
Promoter Holding	50.33%
DIIs Holding	17.30%
FIIs Holding	21.75%
Public	10.43%
Total	**100.00%**

Source : BSE,NSE

Particulars	FY2023	FY2024
ROCE	9.4%	9.8%
ROE	8.9%	9.2%
ROA	4.3%	4.4%
Current Ratio	1.1	1.2
Quick Ratio	0.7	0.8
Cash Ratio	0.4	0.5
EPS	62.4	65.3

Source : Company Research

About: Reliance Industries Limited (RIL) is making significant strides in its solar initiatives, integral to its broader New solar business, which aims to establish the company as a leader in Solar manufacture and achieve net carbon zero emissions by 2035. Central to this vision is the development of one of the world's largest and most advanced solar PV and cell module factories in Jamnagar, Gujarat. This state-of-the-art facility will be the first of its kind to integrate components from quartz to modules, with operations expected to commence by 2024. RIL plans to scale this giga factory to an impressive 20 GW of annual capacity by 2026 and expand it further to 50 GWh by 2027, positioning the company at the forefront of solar manufacturing.

In addition to solar PV manufacturing, RIL is advancing its New Energy initiatives through the establishment of several giga factories, including those for fuel cells, power electronics, and batteries. The company has strategically acquired stakes in key players in the solar energy sector, such as REC Solar Holdings AS and Sterling & Wilson Renewable Energy, which enhances its capabilities and market reach. These acquisitions underline RIL's commitment to integrating cutting-edge technologies and expertise within its operations.

Research and development also play a critical role in RIL's strategy. The company is exploring innovative approaches, such as researching algae for biocrude and biochemicals, aiming to uncover new business opportunities in synthetic biology. This focus on R&D reinforces RIL's position as a forward-thinking leader in the renewable energy landscape. Moreover, RIL is actively leasing arid wasteland in Kutch to generate solar plant and is increasing investments in bioenergy to cater to the growing demand for sustainable transportation fuels. These initiatives not only contribute to RIL's goal of reducing its carbon footprint but also signify its commitment to diversifying its energy portfolio and leading the transition to a greener economy.

Company comprehensive approach to renewable energy presents a compelling opportunity With its ambitious plans for scaling solar manufacturing capacity and expanding into complementary energy technologies, company is well-positioned to capitalize on the global shift towards sustainable energy solutions. The company's integrated strategy, combined with its ongoing investments in R&D and strategic acquisitions, establishes company as a key player in the solar sector, offering significant growth potential and long-term value for investors.

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Thematic Report

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