

India's Wafer-Ingot Manufacturing Capacity to Reach 33 GW by FY30

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Synopsis

- **Exponential Growth:** As of FY26, India's solar energy installed capacity reached 150 GW, increasing its share of total installed capacity from 9% in FY20 to 28% in FY26 and is projected to reach ~290GW by FY30 with annual additions of ~35GW.
- **Backward Integration:** To support the growth in Solar Power, CareEdge estimates India's solar module manufacturing capacity is expected to reach ~ 250 GW by FY30, alongside substantial additions in domestic solar cell manufacturing, which should help meaningfully reduce import dependence at the cell level. Leading players (Adani, Waaree, Tata Power Solar, Premier) are integrating upstream segments (cells, wafers, ingots) to cut imports and boost exports.
- **Key Driving Factors:** Government schemes such as ALMM, PLI, BCD and reduction in GST rates have provided a strong policy push to solar PV manufacturing by encouraging domestic capacity addition, reducing import dependence and improving cost competitiveness across the value chain.

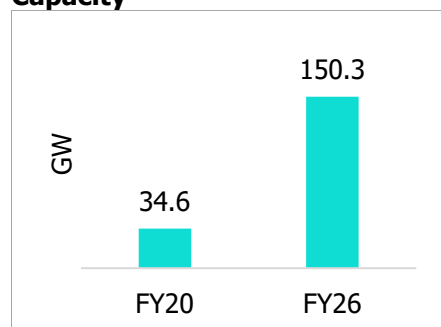
Why Solar Manufacturing Matters for India?

India's solar capacity expansion has been one of the fastest in the world. Annual installations crossed 40 GW in FY26 and is poised to become the second largest solar market globally. Yet for much of this growth, India remained structurally dependent on imports especially from China for its solar equipment supply. This imbalance posed strategic risks: price volatility, supply disruptions, and limited domestic value addition. As a response, India has begun moving backward along the solar value chain – from assembling modules to manufacturing cells, wafers, ingots, and eventually polysilicon.

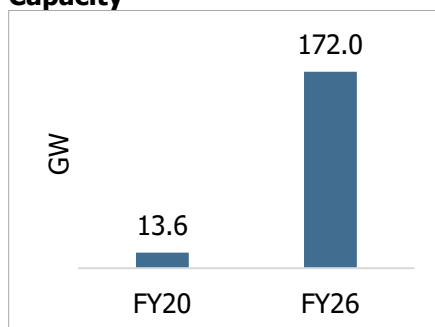
India's solar manufacturing ecosystem has scaled materially, with module manufacturing capacity rising from 13.6 GW in FY20 to 172.0 GW in FY26, surpassing the country's cumulative solar installed capacity of 150.3 GW. This indicates that India has significantly improved its self-sufficiency in module assembly and is now better placed to meet domestic module demand. However, cell manufacturing capacity remains relatively limited at 27.0 GW in FY26, creating a large gap between module and cell capacities. As a result, India continues to depend heavily on imported cells and upstream components such as wafers, ingots and polysilicon, primarily from China and other countries.

Chart1: Cumulative Additions in Solar Power, Module Manufacturing and Cell Manufacturing capacities

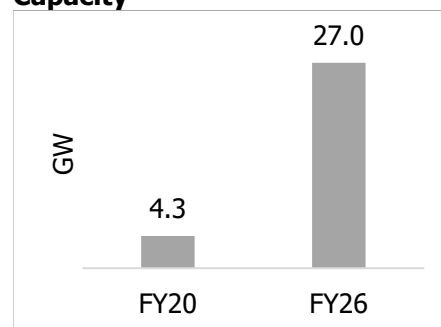
Solar Power Installed Capacity



Solar Module Manufacturing Capacity



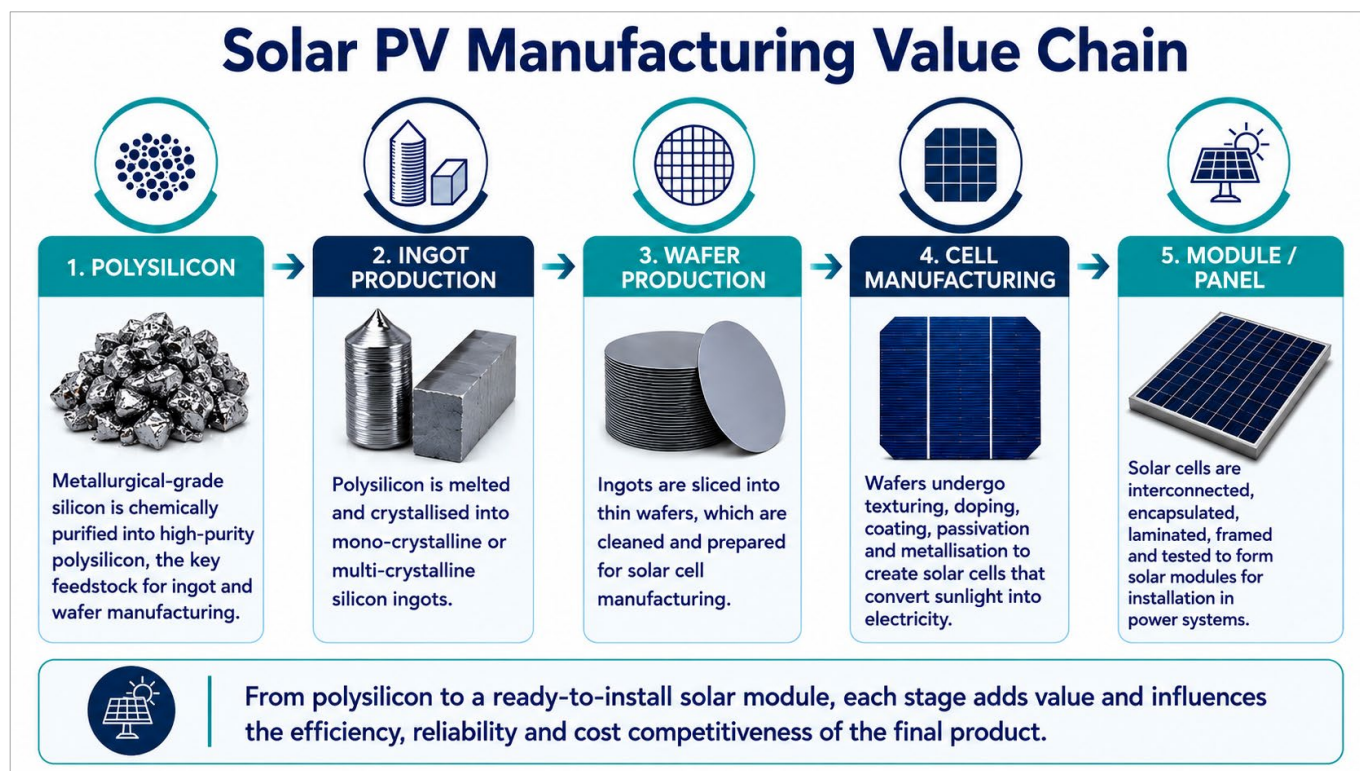
Solar Cell Manufacturing Capacity



Source: PIB, Tech Sci Research, CareEdge Research, Note: The above data covers only ALMM Capacity

Understanding the Solar Value Chain: From Module to Polysilicon

Historically, India participated almost exclusively in the last stage of the solar PV value chain - modules. However, India's solar PV manufacturing ecosystem is gradually moving towards backward integration, which is expected to reduce import dependence, strengthen supply chain resilience and support long-term self-reliance.

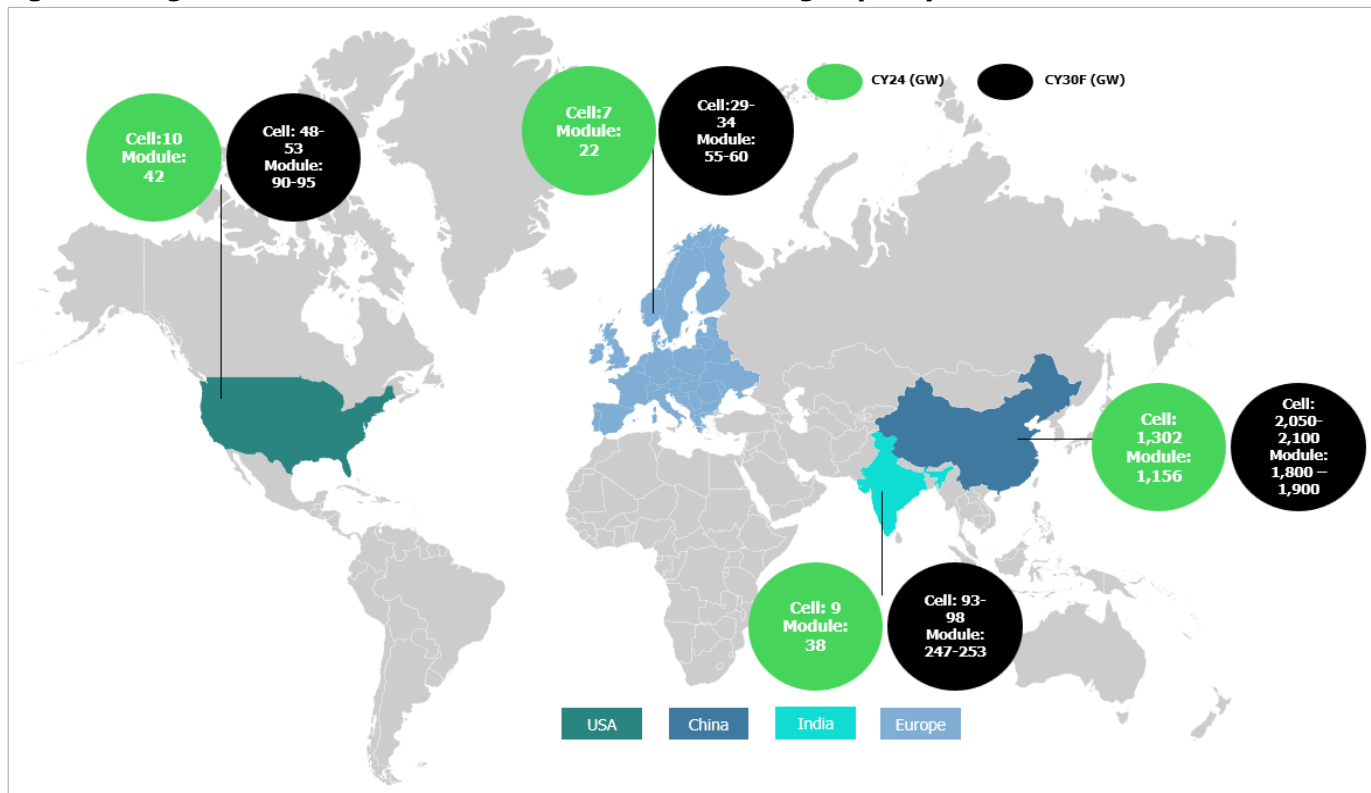


The China Dominance Challenge

While global PV manufacturing capacity continues to expand, its distribution remains highly concentrated and uneven as China dominates the market accounting more than 90% in last five years, driven by large-scale integrated facilities, low-cost polysilicon and sustained investments in high-efficiency technologies.

India is emerging as a fast-growing solar manufacturing hub and its rapid capacity additions are being propelled by policy support such as the Production-Linked Incentive (PLI) scheme, Basic Customs Duty (BCD), Approved List of Models and Manufacturers (ALMM) and state-level incentives, which are encouraging backward integration into wafers and cells.

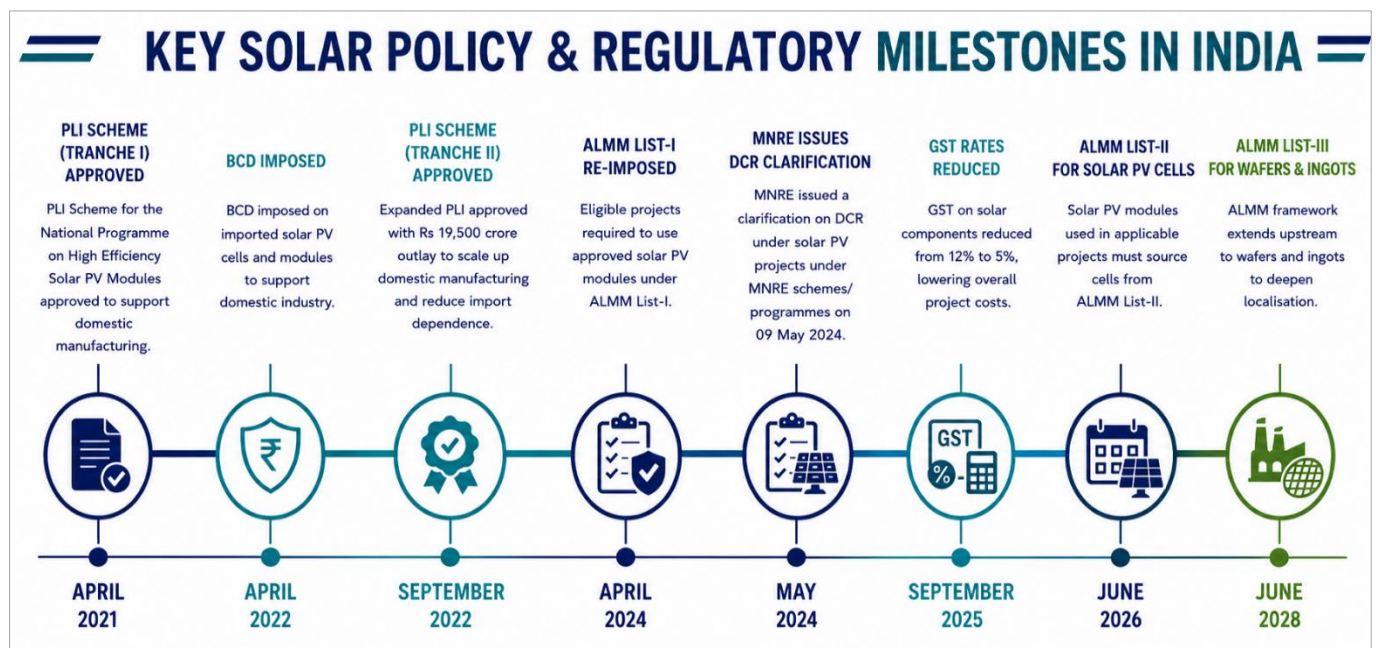
However, despite diversification efforts, China continues to dominate the end-to-end solar PV value chain benefiting from scale, integrated supply ecosystems, and cost leadership.

Figure 1: Region-wise Global Cell and Module Manufacturing Capacity


Source: IEA PVPS, TechSci Research, CareEdge Research, Note: Data for India is in FY Basis. Eg: CY24 data is FY24.

Policy Shift: India's Push Towards Backward Integration

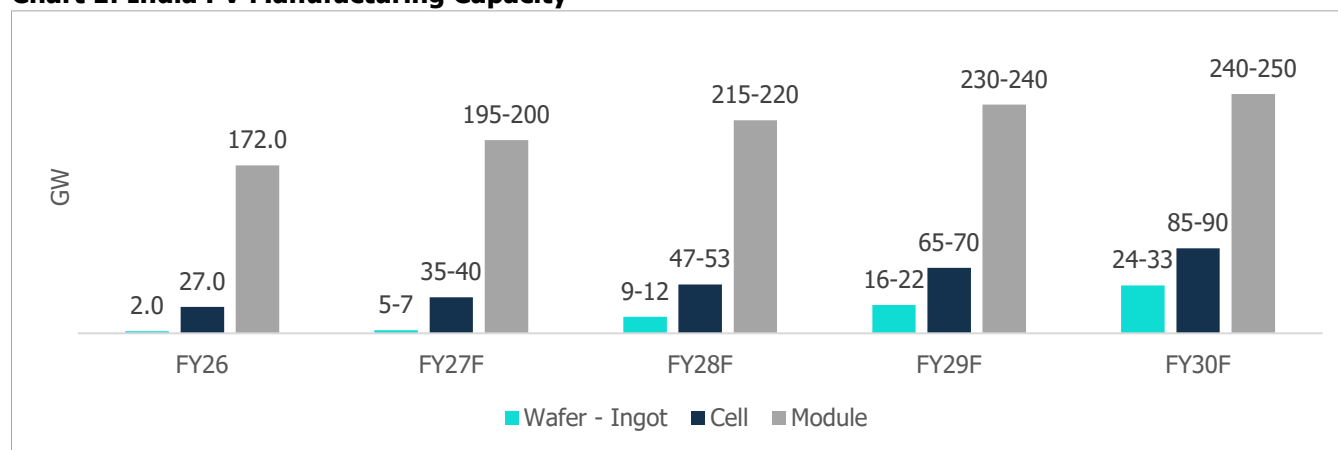
Recognizing these vulnerabilities, the government has launched various Schemes for high efficiency solar PV manufacturing.



Emerging Upstream Capabilities in India

India's solar PV manufacturing ecosystem is gradually moving towards backward integration, which is expected to reduce import dependence, strengthen supply-chain resilience and support long-term self-reliance. As of FY26, India's module manufacturing capacity stands at around 172 GW (ALMM approved), while cell manufacturing capacity is significantly lower at around 27 (ALMM approved) GW. The year FY25 marked an important structural milestone with the commissioning of India's first ingot and wafer manufacturing facility, with an initial capacity of 2 GW. This signals early progress towards deeper vertical integration within the domestic solar manufacturing value chain. The country is also at the cusp of commencing domestic polysilicon production, with major fully integrated manufacturing facilities expected to come online between FY26 and FY28.

Chart 1: India PV Manufacturing Capacity



Source: PIB, CareEdge Research, Note: The above data only covers ALMM Capacity

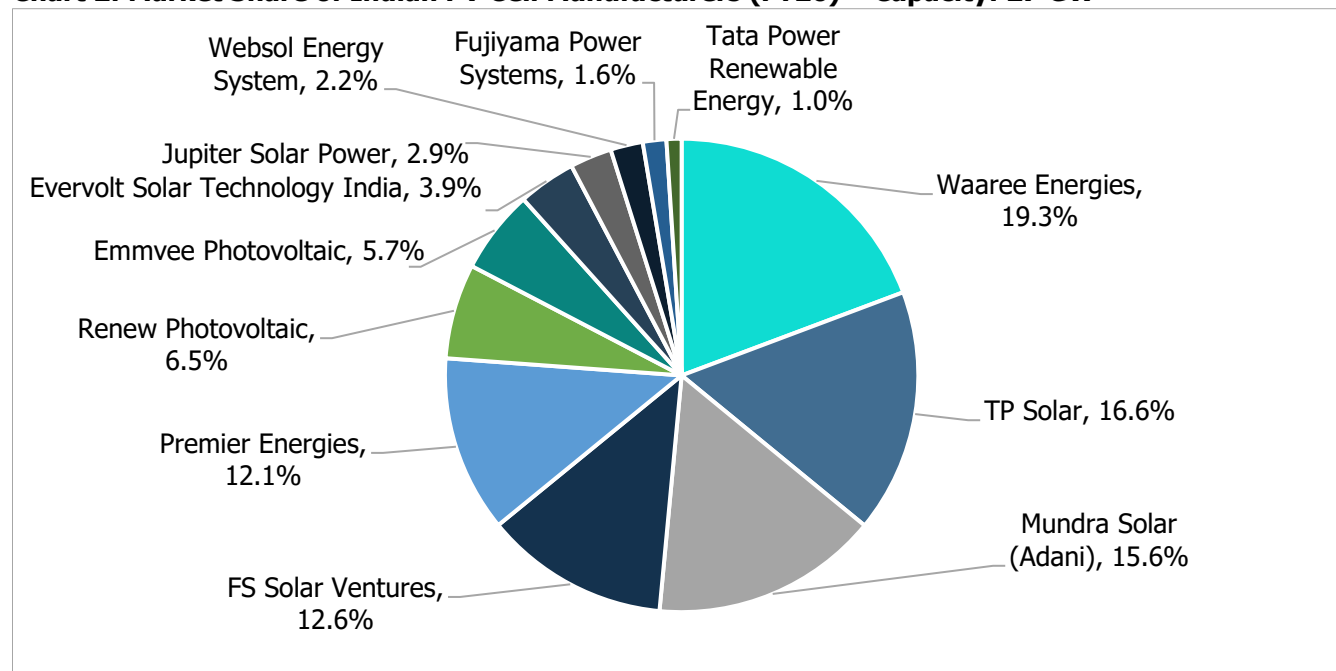
Going forward, India's module manufacturing capacity is expected to reach around 250 GW by FY30, supported by nearly 90 GW of cell manufacturing and around 30 GW+ of ingot and wafer manufacturing capacity. This gradual backward integration is expected to reduce dependence on imported cells and modules, particularly from China, and improve India's ability to meet domestic demand through local production.

Further, as domestic capacities scale up across modules, cells, ingots and wafers, India is expected to emerge as a potential export hub for solar modules. Solar module exports are anticipated to cross 30 GW by FY30, while imports are expected to decline materially. This indicates that backward integration will not only support import substitution but also create export opportunities for Indian manufacturers over the medium term.

Backward Integration by Major Players

Despite the progress in solar PV manufacturing, domestic cell manufacturing currently meets only about 25–30% of demand, resulting in a sizeable gap in the upstream value chain. Consequently, India remains dependent on imports, particularly from China, for solar cells. This exposes the sector to supply-chain disruptions, price volatility and trade-related risks.

Chinese manufacturers continue to benefit from deep vertical integration across polysilicon, ingot, wafer, cell and module, which enables them to maintain lower cost structures. To address this gap, Indian manufacturers are increasingly investing in domestic cell manufacturing. Further, the applicability of ALMM-II, which mandates the use of domestically manufactured cells and modules, is expected to make integrated cell-to-module manufacturing critical for policy compliance, cost stability and participation in utility-scale and government-supported projects.

Chart 2: Market Share of Indian PV Cell Manufacturers (FY26) – Capacity: 27 GW


Source: MNRE, CareEdge Research, Note: The above data only covers ALMM Capacity

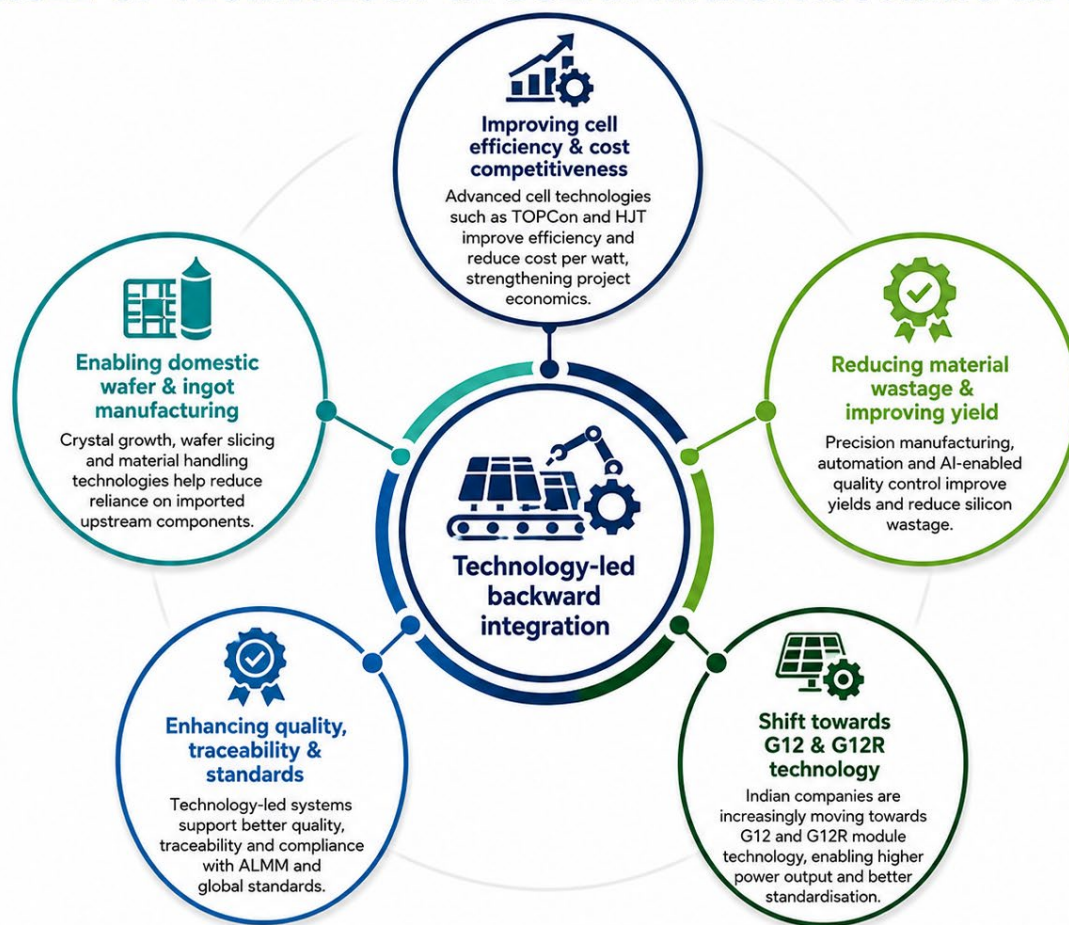
In addition, several large players such as Tata Power, Adani Solar, Waaree and other domestic manufacturers have announced plans to set up ingot and wafer manufacturing capacities in phases. These investments are expected to strengthen India's upstream solar manufacturing ecosystem and support the country's transition from module assembly towards a more self-reliant and export-oriented solar PV value chain.

Table 2: Upcoming Ingot-Wafer Capacities

Name of Company	Planned Capacity (GW) (approx.)	State
Waaree Energies	10.0	Maharashtra
Tata Power Renewable Energy	10.0	Andhra Pradesh
Premier Energies	10.0	Andhra Pradesh
ReNew	6.5	Andhra Pradesh
Avaada Group / Avaada Electro	3.0	Maharashtra
Jakson Group	3.0	Madhya Pradesh
GREW Energy	2.8	Jammu & Kashmir
Solex Energy	2.0	Gujarat

Source: CareEdge Research, Note: Only those companies are presented which has announced capacity only for wafer-ingot

ROLE OF TECHNOLOGY IN SOLAR MANUFACTURING IN INDIA



Conclusion

India is gradually moving from a module assembly-led market towards a more integrated solar manufacturing ecosystem covering cells, wafers and ingots. Policy support through PLI, BCD, ALMM, DCR and GST rationalisation has created a stronger base for domestic manufacturing, while private players such as Waaree, Emmvee are investing in higher-efficiency technologies such as TOPCon, G12 and G12R modules.

However, India is on the path towards becoming a self-reliant economy across the solar value chain. Over the years, India has made strong progress in module manufacturing and is scaling up cell capacity, with upstream segments such as wafer, ingot and polysilicon being at a nascent stage. Hence, backward integration likely to be critical for reducing import dependence, improving supply chain resilience and positioning India as a competitive global solar manufacturing hub.

"India's integrated solar manufacturing build-out is anticipated to require cumulative capex of more than Rs 80,000 crore by FY30 across modules, cells and ingot-wafer capacity. However, the actual requirement may vary depending on global market conditions, equipment costs, technology shifts and supply chain dynamics" stated Nitu Singh, Associate Director, Care Analytics and Advisory Private Limited.

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