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India's Solar Supply Chain: Strategic Dependence, Industrial Policy, and shades of Decoupling from China

Global Supply Chains & Energy Transition

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ABSTRACT

Solar energy has become the world's fastest-growing source of new electricity generation with annual global installations rising from 51.8 GW to 507.2 GW between 2015-2024, and are projected to surpass 1 Terawatt by 2030.[1]. This growth remains heavily concentrated in China, which accounts for most of the global manufacturing capacity across the value chain[3]. India has been a substantial beneficiary of Chinese solar manufacturing, but since 2021 India has pursued a deliberate industrial policy to build domestic manufacturing capability, decouple from Chinese sourcing and reduce its import dependence. This brief examines two developments that predicate on guidance for such a strategy viz. the June 2026 enforcement of Approved List of Models and Manufacturers (ALMM) List-II, mandating domestically manufactured solar cells, and the imposition of US countervailing duties of up to 126 percent on Indian solar exports in 2026 [2,18]. Given India's market potential and technological capacity, it pre-assesses two scenarios for how China may respond to India's push to localise production upstream of module assembly and argues that comparatively plausible scenario — strategic price competition in cells rather than outright disengagement that has a documented precedence in India's own recent experience with module- dumping of selling PVs below production cost.

Key Strategic recommendations for India's solar policies and programs:

- Scale upstream manufacturing (polysilicon, wafers, cells) through expanded Performance based PLI to reduce import dependency.

- Leverage Chinese cell-price competition as the base case for planning purposes and build anticipatory trade-defence capacity with standing anti-dumping and countervailing-duty monitoring.
- Diversify export markets and mitigate trading partner concentration possibly beyond the United States .
- Invest in next-generation R&D such as tandem-perovskite cells and low-silver metallisation, to close the technology gap and stay ahead of rapid obsolescence cycles.
- Use of multilateral institutions such as the WTO, and especially International Solar Alliance, led by India - to shape a diversified global solar supply architecture.

1. Context: Solar's Growth and China's Concentration

The global solar industry has followed an unprecedented growth trajectory with annual global installations rising from 51.8 GW to 507.2 GW between 2015-2024. Annual installations are projected to exceed 1 Terawatt by 2030 - a volume equivalent to the cumulative solar deployment of the preceding seven decades [1]. Costs have fallen by more than 80 percent since 2010, driven principally by falling module prices, manufacturing scale in China and rising cell efficiency, making solar the least-cost source of new electricity generation across most of the world [4].

This growth, however, sits atop arguably the most concentrated supply base of any major energy technology with China’s share exceeding that of OPEC’s peak share of world crude output. China's unusually concentrated supply base accounted for 93.2 percent of global polysilicon production, 96.6 percent of wafers, 92.3 percent of cells, and 86.4 percent of modules in 2024 [3]. This concentration is not incidental; it reflects two decades of deliberate industrial policy, state-directed financing, and the accumulation of process knowledge that is difficult for any entrant — including India — to replicate quickly and may be done only over time. The International Energy Agency estimates Chinese production costs run roughly 20 percent below the United States', 35 percent below Europe's and 10 percent below India which is the smallest cost wedge comparable of any major competitor faces vis-à-vis China, making India the most plausible candidate for cost-competitive localisation. [4]

1.1 Technology Obsolescence as a Compounding Risk

A second structural feature compounds the concentration problem: the rapid pace of cell technology turnover, passivated Emitter and Rear Contact (PERC) architecture, dominant through the early 2020s, is being displaced by TOPCon and heterojunction (HJT) designs offering higher efficiency and slower degradation. China currently leads in third-generation perovskite-silicon tandem cells as well, with laboratory efficiencies above 34 percent already demonstrated – most recently 35.5 percent, certified by the European Solar Test Installation in July 2026 [29]. A country that scales manufacturing capacity in a technology already approaching obsolescence risks building stranded assets rather than durable capability. Notably one example of it is multicrystalline silicon capacity worldwide was rendered largely obsolete within roughly five years of the post-2015 monocrystalline transition, and earlier thin-film ventures, including India's own, were overtaken by crystalline silicon.

2. India's Industrial Policy Response in relation to solar, 2021–2026

2.1 Policy Instruments

India's policy response, has combined four principal instruments:

- The Production Linked Incentive (PLI) scheme for solar modules, launched in two tranches (April 2021 and September 2022) has catalysed substantial new manufacturing investments. As of March 2026 the two tranches (combined outlay INR 24,000 crore) had drawn committed investment of INR 64,873 crore (roughly USD 7.8 billion), against 48.3 GW of awarded module capacity [30].

- The Approved List of Models and Manufacturers (ALMM), which restricts government-linked and open-access projects to domestically manufactured modules under List-I, and since June 2026 domestically manufactured cells under List-II. This requirement is significant given that domestic cell capacity was only around 29–30 GW, compared with more than 190 GW of module capacity as of mid-2025 (see Section 2.4).

- Tariff protection, including Basic Customs Duty on modules and cells, supplemented in 2025 by anti-dumping duties of 23–30 percent on Chinese cells and modules following a Directorate General of Trade Remedies finding [11].

- While trade and custom duties are under purview of the Centre, State-level incentives on land, power, and infrastructure vary and hence investment is concentrated in states such as Gujarat, Rajasthan, and Andhra Pradesh.

2.2 ALMM List-I: Origins, Suspension, and Reinstatement

The ALMM framework predates the current cell mandate by several years and offers the closest available precedent for how India's domestic content rules play out once implemented. The legal foundation was laid by a Ministry of New and Renewable Energy (MNRE) order of January 2, 2019, establishing a compulsory registration system intended to address quality, traceability, and energy-security concerns in a sector then dominated by uncertified imports [23]. Such framing instead of explicit local-content rule, also matters for trade law as the WTO Appellate Body had found India's earlier domestic-content requirements inconsistent with its national-treatment obligations [28]. The first List-I for modules was published on March 10, 2021, with roughly 8.2 GW of enlisted capacity, and compliance became mandatory for government and government-assisted projects from April 2021 [23,27]. The scope was widened in

January 2022 to cover open-access and net-metering projects as well (net metering allows consumers with rooftop solar to export surplus power to the grid and be billed only for their net consumption), considerably expanding the demand pool the mandate could anchor [25].

List-I's implementation history however may be chequered. In March 2023, citing COVID-era supply disruptions and insufficient domestic capacity to meet a fast-growing project pipeline, MNRE suspended ALMM enforceability for the 2023–24 financial year, exempting projects commissioned up to March 31, 2024 [23]. This was a significant, if temporary, relief.

The mandate was reinstated effective April 1, 2024, this time without a blanket exemption, following confirmation from MNRE on March 29, 2024[24,25]. By that point, domestic manufacturing had scaled considerably: government officials cited roughly 37 GW of capacity already committed under ALMM at the time of reinstatement[24], and module imports subsequently declined from USD 4.35 billion in FY2024 to USD 2.15 billion in FY2025 even as enlisted capacity grew more than twelvefold from its 2021 base, crossing 100 GW by August 2025 [8,27].

2.3 What List-I's History Implies for List-II

Three features of the List-I experience recur, with variations, in the List-II rollout examined in Section 3 and are worth stating explicitly because they bear directly on this brief's scenario analysis in Section 4.

First, India's domestic content mandates have not been implemented as one-shot policy announcements but iteratively with frequently revised processes — suspended, narrowed, widened, and reinstated in response to evolving capacity realities. This is arguably a strength (it shows the regulator responding to facts on the ground rather than enforcing a rule mechanically that would translate into a supply shortage) but it also means the credibility of any single deadline has, historically, been conditional rather than absolute, a pattern List-II's mid-2026 "no blanket extension" stance was explicitly designed to break.

Second, each suspension or relaxation of List-I created a temporary import surge — the FY24 spike to USD 4.35 billion noted above is the clearest instance [26] — that Chinese exporters were well positioned to exploit given their scale and existing relationships with Indian developers. This is the precedent against which the cell-import surge documented in Section 2.4 below, and the price-competition dynamics discussed in Section 4, should be read: gaps in enforcement timeline have repeatedly translated into spikes in Chinese-origin supply, not gradual adjustment.

Third, the List-I reinstatement coincided with, and was partly justified by reference to, concerns about Chinese dumping specifically, rather than quality or traceability alone — several contemporaneous accounts frame the 2024 reinstatement explicitly as a measure to protect domestic industry from Chinese price competition. Plant-level benchmarking by CEEW finds Indian cell manufacturing costs remain materially above Chinese levels even at scale, driven by capital, power, and consumables costs [32]. This framing matters because it shows that, two years before the cell-level mandate this brief examines, the official justification for domestic content rules had already shifted from quality assurance toward protection against Chinese pricing; whether that characterisation of Chinese behaviour is analytically warranted is assessed, rather than assumed, in Section 4.

2.4 The Cell Capacity Gap Beneath List-I's Success

List-I's volume success possibly masked a structural imbalance that became fully visible only once List-II approached. By mid-2025, India's domestic cell manufacturing capacity stood at approximately 29–30 GW against module capacity exceeding 190 GW, a ratio independent analysts have characterised as structurally imbalanced: "module overcapacity, insufficient cell capacity, and high costs" [13]. The mismatch was sharpest in TOPCon, the technology now preferred for land-constrained commercial and industrial projects: approved TOPCon module capacity is close to 172 GW, while domestic TOPCon cell capacity remains under 10–15 GW [7]. The Council on Energy, Environment and Water estimates that the resulting cell-cost premium could raise domestic module costs by roughly USD 0.024 per watt-peak, which denotes the module's rated output under standard test conditions, translating into a domestic tariff increase of approximately INR 0.14 per unit — about 5–6 percent of recently discovered utility-scale solar tariffs of INR 2.5–2.6 per kWh [31].

Until the closure of the cell-import channel in June 2026, India's module industry had relied on a model of "importing Chinese cells and assembling domestically" — List-I had succeeded in localising assembly while leaving the input layer immediately beneath it as dependent on China. Chinese cell exports to India thus rose from roughly 33 GW to over 49 GW between the first eleven months of 2024 and the same period in 2025 — a year-on-year increase of 47 percent — as Indian assemblers raced to secure cell supply ahead of the List-II deadline [13]. This dependence, and List-I's own history of suspension and reinstatement, form the immediate backdrop against which ALMM List-II must be assessed For perspective, mandate-induced cost premia have been larger elsewhere with domestically produced modules in the United States which carried price premia on the order of 30–40 percent over imported equivalents, against the roughly 5–6 percent tariff impact estimated for India above.

3. ALMM List-II: Enforcement, Mismatch, and Strategic Significance

ALMM List-II extends the List-I logic described in Section 2 one layer further up the value chain, requiring that modules listed under List-I use cells exclusively from domestically approved manufacturers. The first List-II was published on July 31, 2025, and an MNRE office memorandum of December 9, 2024, had already fixed mandatory compliance from June 1, 2026, with projects whose bid submission preceded that memorandum exempted regardless of commissioning date [23,6]. Unlike List-I's 2023 suspension, MNRE held the June 1, 2026 deadline without a blanket extension, applying it to government-linked, net-metering and open-access projects commissioned from that date [2,6]. A further List-III, covering ingots and wafers — the segment in which Chinese capacity share exceeds 95 percent and Indian domestic capacity is negligible — is scheduled for June 1, 2028 [2].

MNRE has paired strict enforcement with a narrow, transparent relief mechanism: developers who had achieved verifiable milestones — completed module delivery, advanced grounding, or financial closure — before the deadline could apply for case-by-case extensions through the National Institute of Solar Energy portal, with claims due by June 30, 2026 [9,10]. This design, a firm deadline paired with discretionary but documented relief, is intended to preserve policy credibility while limiting near-term disruption to projects already under construction. Credibility is the operative constraint, because upstream cell and wafer plants are multi-year, capital-intensive commitments, and private investment responds to the expected durability of demand-side mandates, an expectation that List-I's suspend-and-reinstate history had already eroded.

Industry response may have been divided along predictable lines. Vertically integrated manufacturers have characterised the mandate as a decisive and overdue signal that India's solar transition will be built on domestic capability rather than import dependence[7]. Standalone module assemblers and several commercial and industrial developer associations, by contrast, have warned that limited open-market cell availability — concentrated among large integrated players such as Adani's Solar, Premier Energies, and Waaree — could strand investments and raise project tariffs by an estimated 30–40 paise per unit in the near term [7,9]. Both positions are, in a narrow sense, may seem correct: the policy is simultaneously accelerating genuine vertical integration and exposing the cost of having sequenced module-capacity growth ahead of cell-capacity growth.

4. China's Strategic Response: Two Scenarios

The preceding sections describe India's policy architecture with Chinese behavioural response as fixed or given. We need to account for Chinese responses particularly as China's solar industry is itself under considerable strain – contending with what Chinese policymakers' term "involution," or ruinous internal overcapacity, alongside tightening market access in the United States and the European Union [3]. How China responds to India's backward-integration push of moving upstream from module assembly into cells, wafers, and ultimately polysilicon, will materially shape whether ALMM List-II and List-III achieve their stated objective of reducing import dependence and building an integrated domestic value chain from polysilicon to modules in support of India’s 2030 non-fossil capacity targets. This section sets out two scenarios: cooperative disengagement (Scenario A) and competitive engagement through price competition (Scenario B).

4.1 Scenario A: Cooperative Disengagement

In this scenario, China is already absorbing significant demand growth in Europe, Latin America, the Middle East, and Africa and effectively cedes the Indian and US markets as a matter of strategic prioritisation. There is a documented basis for this possible Chinese strategy: Chinese module exports to Europe rose 47 percent in early 2023 alone [15], and by early 2026 Chinese cell and wafer exports to Asia and Africa were setting successive monthly records, with exports to Africa rising 176 percent and to Asia doubling in a single month [12]. If China's commercial calculus increasingly favours these higher-growth, lower-friction markets, it could, in principle, deprioritise contesting the Indian cell and wafer market, allowing a comparatively smooth Indian transition up the value chain, first into cells and in time into wafers and polysilicon, without the price warfare that accompanied the 2021 module mandate. This benign path depends on a crowding-out dynamic, however: China stays out of India only because demand in Africa, Asia and Latin America is absorbing its output, and may leave India largely confined to the domestic market.

This is, in our assessment, the less probable of the two scenarios over the policy horizon spanning List-II enforcement, the 2028 List-III deadline, and the run-up to India's 2030 capacity targets. Three considerations weigh against it. First, China's market diversification is a response to demand-side opportunity and Western trade barriers, not an indication of reduced competitive intent toward India specifically; Chinese firms have shown no comparable pattern of voluntarily exiting a market once domestic content rules tighten — the opposite has historically been true (Section 4.2). Second, India's projected solar additions of roughly 50 GW in 2026[37], make India too large a market for Chinese manufacturers, who face acute overcapacity at home, to simply forgo. Third, cells and wafers are the higher-value-added, more strategically significant segments, unlike the commoditised module tier, and the ones Chinese firms have the strongest incentive to defend, since conceding them would help validate the very value-chain migration India is attempting. In global value chain terms the asymmetry is clear: China occupies the upstream, high-value-added positions and participates forward, exporting intermediates for assembly elsewhere, while India has sat downstream, reliant on imported cells and wafers and, where it exports modules, carrying largely Chinese value added within them. India's strategic aim is precisely to move from that downstream position toward the upstream one.

4.2 Scenario B: Active Resistance Through Competition

In this scenario, China responds to India's cell and wafer localisation push the way it responded to the original 2021 module mandate: not through formal trade retaliation, but through aggressive price competition designed to keep Indian demand flowing toward Chinese-origin products at the next vulnerable layer of the value chain. There is a close and recent precedent in this regard. Following the reinstatement of ALMM List-I, Chinese exporters cut prices sharply of solar modules while keeping cell prices elevated. This basically killed the incentive of making modules in India given the conversion cost was not based on fundamentals — OPIS's benchmark FOB China TOPCon module price was roughly USD 0.088 per watt-peak by September 2025, with spot indications for some markets as low as USD 0.08/Wp [33]. Additionally, Chinese manufacturers of adjacent inputs, on solar glass in particular, cut prices sharply enough to push Indian producers such as Borosil Renewables from a pre-tax profit into a loss within a single fiscal year, a dynamic widely described in the Indian trade press as a deliberate price war rather than ordinary competition [22].

Nor is price the only instrument available: non-price levers include export controls on solar manufacturing equipment and wafer technology (added to China's export-control catalogue from 2023), slower technology licensing, tying cell supply to module purchases, preferential delivery and credit terms for non-Indian buyers, and competition for scarce technical talent. The same logic plausibly extends to cells now that List-II has foreclosed direct cell imports for covered project categories and would extend again to wafers and polysilicon as List-III approaches in 2028. The mechanism is straightforward: remove the incentive to manufacture the protected goods in India and just import, which even after imposition of duties would be cheaper than the local alternative. The surge in Chinese cell exports ahead of the List-II deadline (Section 2.4) is consistent with this pattern: rather than ceding the Indian cell market in anticipation of localisation, Chinese exporters appear to have maximised shipments while the window remained open, a behaviour more consistent with contestation than disengagement. Whether contestation of this kind is a concern at all rests on a prior question, that were deployment the sole aim cheap Chinese supply would be a benefit to accept rather than a dynamic to resist; that question is fundamental and is taken up directly in Section 4.3, while the present section takes localisation as given and traces how China is likely to contest it.

We regard Scenario B as the more probable outcome in the near to medium term, for three reasons. First, it has a directly observable precedence in Indian solar modules and glass; China's revealed playbook on trade-barrier circumvention is price compression of the protected layer instead of retreating. Second, it is consistent with China's own domestic incentive structure, with the China Photovoltaic Industry Association data showing extreme overcapacity in cells, wafers, and polysilicon [3], Chinese producers have a strong commercial incentive to export surplus capacity at low or negative margins rather than idle it, regardless of the strategic calculus this brief ascribes to Beijing. Third, India's own anti-dumping and customs-duty actions on solar glass, cells, and modules through 2024–2025 — each introduced only after Chinese pricing had already displaced or threatened to displace Indian producers [22,14] — suggest that India's trade-defence institutions have so far been reactive rather than anticipatory, which is precisely the posture Scenario B would exploit at the wafer and polysilicon stage.

4.3 Implications for Policy Sequencing

The sequencing question arises only once localisation is taken as an objective. On deployment economics alone the case runs the other way: if the aim were solar penetration, importing cheap Chinese cells would dominate domestic manufacture on static-efficiency grounds, and protection would risk recreating the pre-liberalisation automobile paradigm of high-cost, low-quality output behind closed borders. The case for localisation therefore rests not on deployment but on three grounds: the energy-security exposure of a 500 GW non-fossil programme to a single external supplier; the option value of retaining domestic capability while the technology is still moving down a steep learning curve; and manufacturing employment and agglomeration spillovers. The security ground is also what forecloses the narrower alternative of specialising downstream and importing the harder upstream layers, since the exposure is concentrated precisely there, in wafers and polysilicon, where Chinese share is near-total and manufacturing equipment and wafer technology are already under export control; that is why the case runs to those stages rather than stopping at assembly. Only with that objective accepted does the question become how to build the capability at least cost and least distortion.

On that question, if Scenario B is the more realistic baseline, the implication is first order: India's List-III transition to wafers and polysilicon by 2028 cannot rely on tariff and ALMM-style demand mandates alone, since those instruments act on import volumes but not on the underlying price-competitiveness gap that Chinese suppliers can exploit at each successive layer. The instruments in this design each address a different gap. ALMM and tariffs act on demand and on the output price at the point of sale; PLI acts on the operating-cost gap, subsidising production but not by itself ensuring that the subsidised output is bought; and concessional finance acts on the cost-of-capital gap. This is why PLI does not remove the case for tariffs: PLI lowers the cost of producing the protected good, while tariffs and ALMM secure the demand that keeps PLI-backed plants utilised. The two are complements, though their combination raises the effective rate of protection, so the marginal case for further tariff increases weakens as that capacity comes online.

A credible response also requires anticipatory trade-defence capacity: standing mechanisms to detect and act on sustained below-cost import pricing at the wafer and polysilicon stage before, rather than after, Indian producers are forced into losses, as happened with solar glass. The operative benchmark is the anti-dumping below-cost standard, not any test of predatory intent, and this is deliberate. Overcapacity-driven exports at marginal cost need not be predatory in the industrial-organisation sense, which additionally requires a prospect of recouping losses through later market power, yet their effect on Indian producers is identical. Anti-dumping sidesteps that difficulty, because normal value is constructed from full cost plus a reasonable margin, so glut-driven marginal-cost exports fall below it without any finding of intent. The success metric is then not import substitution as such but whether domestic producers can survive at import-parity prices, since Atmanirbharta is meaningful only if capability is retained at world prices rather than behind them [22].

Concessional finance stands on its own basis rather than as a supplement to tariff protection. Polysilicon and wafer plants are highly capital-intensive and face a cost-of-capital disadvantage against Chinese producers backed by cheap state financing, one that no tariff can close, since a tariff acts on price at the point of sale and not on the cost of building the plant. It is therefore proposed alongside calibrated, time-bound tariff protection, not as a substitute for it, and the point that tariffs alone cannot offset price resistance from an overcapacity-driven competitor without pushing domestic costs to politically unsustainable levels is a further reason rather than the primary one. The dynamics of that overcapacity are stark: CPIA data put global module capacity at roughly 1,430 GW in 2025 against production of 694 GW, with Chinese polysilicon and wafer utilisation below 50 and 40 percent respectively, conditions under which exporting at or below marginal cost is privately rational for Chinese firms [34].

5. The US Export Shock

India's effort to reduce Chinese import dependence has coincided with a separate shock from the US policy. The United States historically absorbed the substantial majority of India's solar exports, by some estimates over 90 percent of module exports and over 88 percent of cell exports [17], despite supplying only a small share of total US solar imports, an asymmetry that made the relationship lucrative but structurally fragile or possibly politically untenable.

Tariff rates on Indian solar exports to the US rose from roughly 14 percent before 2025 to a blanket 50 percent by August 2025. A bilateral framework in February 2026 then brought the blanket burden down to 18 percent, before a separate trade-remedy duty pushed the effective rate on cells far higher. On February 24, 2026, the US Department of Commerce announced preliminary countervailing duties up to 126 percent on Indian solar cells and modules, following a petition from the Alliance for American Solar Manufacturing and Trade alleging that Indian manufacturers benefited unfairly from government subsidies, including India's own PLI scheme [18,19]. Indonesia and Laos received comparable higher duties in the same proceeding [18], consistent with a broader US effort to close off Southeast and South Asian routes for Chinese-linked solar content [16]. In GVC terms India's solar exports carry high backward participation, most of their value added originating in China through imported cells and wafers, which is exactly what the US actions target. The February 2026 framework cut tariffs but left the countervailing track untouched, whether solar obtains any carve-out in the proposed India–US bilateral trade agreement remains unresolved, with no solar-specific provisions public as of writing.

Impact of tariff on the market reaction was immediate with major Indian manufacturers, including Adani Green Energy, Waaree Energies, Premier Energies, and Vikram Solar, saw share price declines of up to 18 percent in the days following the announcement [20,21]. Export values fell by an estimated 35 percent in 2026, and Indian manufacturers have since pursued two adaptation strategies of diversifying toward European, Middle Eastern, and Latin American buyers, and establishing manufacturing capacity inside the United States itself to bypass the tariff wall entirely. Waaree, for instance, has built roughly 3.2 GW of US-based capacity in Texas and 1GW in Arizona [17,21].

The broader lesson parallel to section 4 is that, just as China is unlikely to simply concede the cell and wafer markets, the United States, having moved to protect its manufacturing, is evidently unwilling to absorb Indian export volume on prior terms. India's manufacturing strategy is being tested simultaneously on its import-substitution flank and its export-market flank, and the lesson in both cases is the same: India cannot assume a cooperative external environment and must plan for active, not passive, resistance from both its primary input supplier and its primary customer. The corollary is preemption: qualifying under emerging origin-verification regimes, diversifying export markets, and building trade-defence capacity before further measures land, rather than adapting after the fact as in 2026.

6. Policy Recommendations

The recommendations below are calibrated to the more adversarial baseline developed in Section 4 (Scenario B) and the demand-side stress documented in Section 5, and to List-I's own history of conditional, frequently revised enforcement (Section 2.2).

Recommendation 1: Extend PLI to Upstream Components, with Anticipatory Trade Defence

PLI coverage should expand to polysilicon, ingots, wafers and cells, paired with a standing, rules-based anti-dumping monitoring mechanism for those segments. Allocation and monitoring should extend the existing implementation model: capacity awarded through transparent reverse auctions (as under Tranches I–II via IREDA and SECI) with incentives disbursed only against third-party-verified production and sales over five years and quarterly public reporting of disbursements.

Recommendation 2: Sequence ALMM Enforcement to Match Verified Capacity

List-II's case-by-case extension mechanism should be formalised into a published, rules-based framework, closer to a transparent rule than the discretionary suspend-and-reinstate pattern seen with List-I, ahead of the considerably harder 2028 List-III deadline for ingots and wafers. The US Section 201 product-exclusion process is a workable model, with its published eligibility criteria, time-bound decisions and reasoned public orders.

Recommendation 3: Invest in Technology R&D to Avoid Trailing the Frontier

A National Solar Technology Mission, co-funded by government and industry and drawing on capability at the IITs, CSIR laboratories, and the National Institute of Solar Energy, should target TOPCon, HJT, and perovskite-tandem technologies. Indian domestic manufacturers spend up to 0.1 per cent of revenue on R&D, compared to Chinese counterparts who can spend up to 2 per cent. Further, public R&D in solar technology lags in terms of both scale and industry participation when compared to solar technology-focused R&D for nations like the USA and Japan [36]. This is necessary independent of the China scenario: even under Scenario A, a domestic industry built on yesterday's cell architecture is not strategically secure.

Recommendation 4: Diversify Export Markets Beyond the United States

Given the 126 percent preliminary US duty, the export-led capacity-absorption model of 2022–2024 is no longer viable at scale. But the potential elsewhere is concrete. Africa was the world's fastest-growing solar market in 2025, installing approximately 4.5 GW of new solar PV capacity representing a 54% year-on-year increase [35]. India should pursue bilateral solar partnerships with these high-growth regions such as Africa, Southeast Asia, the Middle East, and Latin America, while supporting in-market manufacturing strategies already pursued by Waaree and Premier Energies.

Recommendation 5: Use Multilateral Platforms to Build Coalition-Based Resilience

India's role in the International Solar Alliance and its G20 relationships should be used to pursue concrete joint-investment facilities for non-Chinese component manufacturing.

7. Conclusions

This brief has argued that India's solar industrial strategy is being tested on two fronts simultaneously: an upstream front, where ALMM List-II has exposed a genuine capacity mismatch between modules and cells; and a downstream front, where US countervailing duties have closed off the export channel that previously absorbed excess Indian manufacturing capacity. Neither development may be fatal to India's broader ambitions, but both call into question a planning assumption implicit in much of the existing policy discourse that China's role in the supply chain will recede passively as India's domestic capability grows.

The scenario analysis in Section 4 suggests this assumption is unlikely to hold: China's revealed behaviour points to continued, adaptive resistance rather than disengagement. If this pattern repeats at the wafer and polysilicon stage as List-III approaches in 2028, India's localisation strategy will require trade-defence institutions that are anticipatory rather than reactive, and a financing architecture for upstream capacity that does not assume tariff protection alone will be sufficient.

India retains the fundamentals for a credible long-term strategy with large and growing domestic market, a substantial engineering talent base, and an expanding diplomatic network for coalition-building. What this brief adds to the existing literature is a more adversarial baseline for how the next phase of that strategy, cells now, wafers and polysilicon by 2028, is likely to unfold, and a corresponding case for building institutional capacity that does not depend on Chinese cooperation.

References

[1] International Energy Agency, Solar PV Global Supply Chains (Paris: IEA, 2022).

[2] TaiyangNews, "India Brings ALMM List-II for Solar Cells into Force," June 2026.

[3] China Photovoltaic Industry Association data, cited in Center for Strategic and International Studies, March 2026.

[4] International Energy Agency, Solar PV Global Supply Chains: Executive Summary (Paris: IEA, 2022).

[5] Center for Strategic and International Studies, "China's Solar Industry Is in Upheaval," March 2026.

[6] Ministry of New and Renewable Energy, Government of India, "Approved List of Models and Manufacturers (ALMM)" notification portal, accessed June 2026, https://mnre.gov.in/en/approved-list-of-models-and-manufacturers-almm/.

[7] Down To Earth, "India's Solar Ambitions Face a Factory-Floor Test," June 2026.

[8] Council on Energy, Environment and Water (CEEW), "Unlocking Solar Manufacturing Potential with Solar PV Modules," November 2025.

[9] Business Standard, "Solar Industry Split as Locally Made Cell Mandate Kicks In on Monday," May 31, 2026.

[10] ESG News.Earth, "India Enforces Strict Solar Cell Sourcing Mandate," June 2026.

[11] Shanghai Metals Market (SMM), "India Imposes Three-Year Anti-Dumping Tariffs on Solar Cells and Modules from China," October 2025.

[12] Ember, "Chinese Solar Exports Double in a Month to Hit Record High Amid Energy Crisis," April 2026.

[13] AL Circle / SMM, "India's Solar Protectionism Against China Backfires," December 2025.

[14] InfoLink Consulting, "India's Anti-Dumping Final Findings on Chinese Solar Cells: Why Tariffs Alone Isn't Enough," October 2025.

[15] Ember, "Solar Exports from China Increase by a Third," 2026 update.

[16] Lowy Institute, "The Sun Is Setting on Southeast Asia's Solar Exporters," May 2026.

[17] Down To Earth, "US Tariffs Slash India's Solar Exports by 35%, Report Urges Market Diversification," March 2026 (citing Climate Risk Horizons).

[18] Bloomberg, "US Finds That India, Indonesia, Laos Unfairly Subsidized Solar," February 24, 2026.

[19] OilPrice.com, "India's Solar Manufacturers Slapped with 126% U.S. Tariff," February 27, 2026.

[20] Whalesbook, "US Solar Tariffs Hit India: Trade Deal Ambiguity Amid Duty Surge," February 28, 2026.

[21] OilPrice.com, "India's Solar Manufacturers Slapped with 126% U.S. Tariff," February 27, 2026.

[22] Saur Energy, "How Chinese Solar Glass Dumping Triggers Price War in India," 2024.

[23] AZB & Partners, "ALMM/RLMM Compliance: A Regulatory Deep Dive," October 2025.

[24] India Briefing, "India Reinstates ALMM for Solar PV Modules," June 2024.

[25] JSA Prism, "Energy Newsletter," July 2025.

[26] ICRA data, cited in India Briefing, "India Reinstates ALMM for Solar PV Modules," June 2024.

[27] Omkar Mhatre, "India Achieves Historic Milestone of 100 GW Solar PV Module Manufacturing Capacity under ALMM," August 2025.

[28] World Trade Organization, India – Certain Measures Relating to Solar Cells and Solar Modules (DS456), Appellate Body Report WT/DS456/AB/R, September 2016.

[29] pv magazine, "Longi sets new world record with 35.5%-efficient perovskite-silicon tandem cell," July 2026.

[30] Business Today, "PLI scheme attracts Rs 2.4 lakh crore in investments till March 2026," June 2026; Press Information Bureau, PLI sectoral data, August 2025.

[31] IEEFA, "Utility-Scale Renewable Energy Tendering Trends in India," 2025.

[32] Council on Energy, Environment and Water (CEEW), "Solar Cell Manufacturing Cost and Supply Chain in India," May 2026.

[33] pv magazine, "China TOPCon Solar Module Market Awaits Q4 Policy Signals," September 26, 2025, https://www.pv-magazine.com/2025/09/26/china-topcon-solar-module-market-awaits-q4-policy-signals/

[34] China Photovoltaic Industry Association data, reported in OPIS and TaiyangNews, 2025–2026.

[35] Global Solar Council / AFSIA, Africa Solar Outlook 2026; DNV forecast of MENA solar additions to 2040, reported in PV Tech, January 2026.

[36] Council on Energy, Environment and Water (CEEW), "Advancing Solar Cell Manufacturing in India: Bridging Gaps in Cell Technology and Lowering Manufacturing Costs," May 2026.

[37] Wood Mackenzie, "From Modules to Cells: India Deepens its Solar PV Push," cited in pv magazine, "India on track for record 50 GW of solar installations in 2026," August 2026.

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