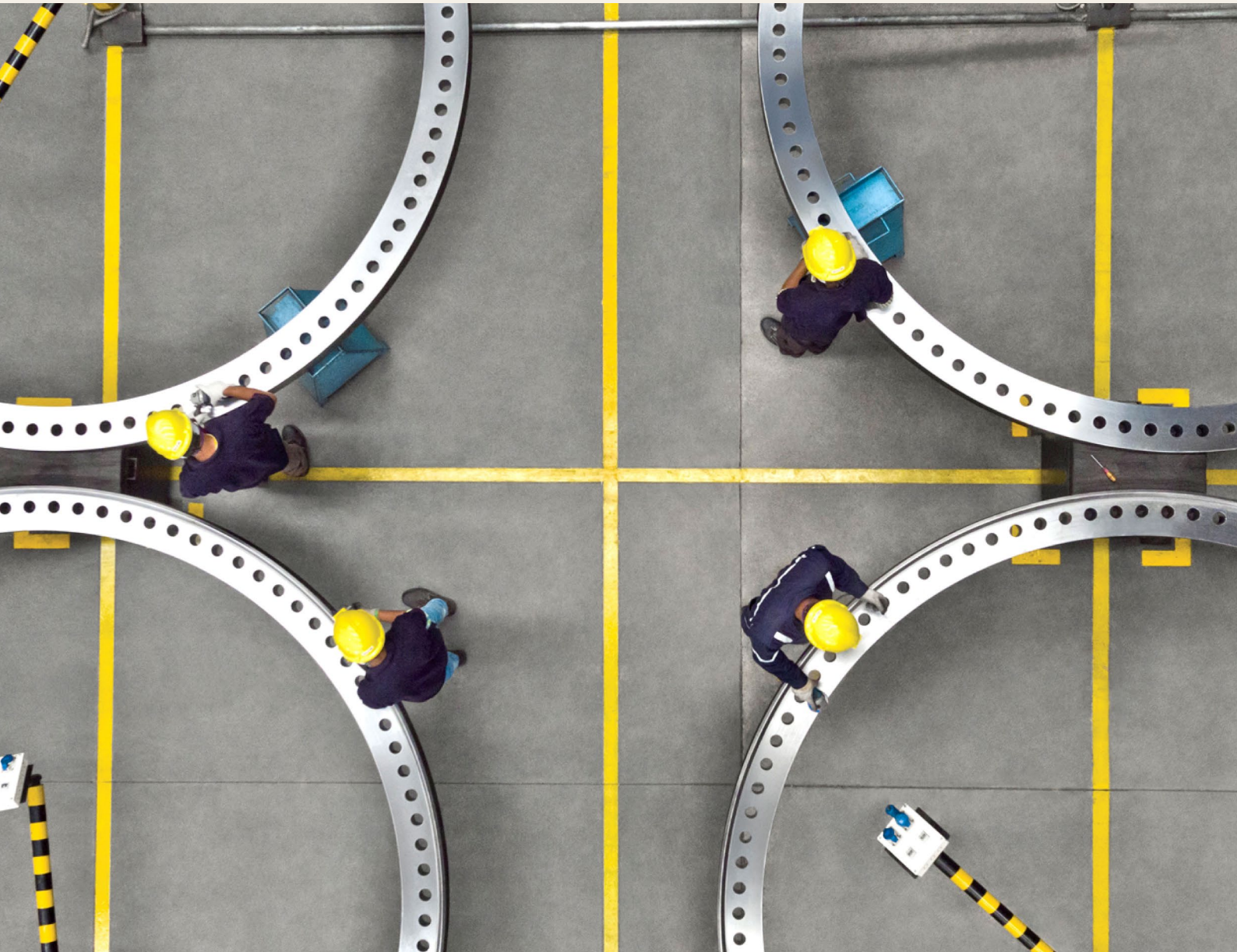
Issue Brief | November 2026

Assessing Indigenisation in Indian Manufacturing

A Pillar-based Framework Tested in the Wind Industry

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Ushashi Datta



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Ushashi Datta



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Foreword



Girish R. Tanti
Chairman
Indian Wind Turbine Manufacturers Association

India's wind energy journey is among the most instructive chapters in the country's clean energy transition. Over three decades, the sector has grown into a large and capable industry, with an annual wind turbine manufacturing capacity of around 24 GW and one of the largest installed bases outside mainland China. As the country works towards 500 GW of non-fossil capacity by 2030, wind will remain central to India's energy security and to its ambition of becoming a global manufacturing hub for clean energy technologies.

Through this period, the idea of *Atmanirbharta* has guided much of what our industry has sought to build, yet the term is invoked far more often than it is defined. It is often equated with local content, a share of total cost that captures where expenditure occurs but not where strategic capability or control resides. A high headline-indigenisation figure could mask a persistent dependence on specific high-value components.

Self-reliance is a larger and more demanding idea, concerning not only where value is added, who owns the machinery, technology and skills, and who commands the capital. It is against this backdrop that I welcome this issue brief, prepared by the Council on Energy, Environment and Water (CEEW) in collaboration with the Indian Wind Turbine Manufacturers Association (IWTMA). The framework it sets out is a first serious attempt to define *Atmanirbharta* in the wind sector on a principles-based, component-by-component basis. By assessing self-reliance across distinct dimensions, and along a graded scale of maturity, it offers something our policy conversation has long lacked: a common vocabulary and a diagnostic tool.

A framework of this kind will help policymakers define *Atmanirbharta* for the wind sector based on the sector's peculiarities, which will eventually guide policies to augment the local production. The framework has been shaped by consultations with manufacturers across the value chain, and I am grateful to every member firm that gave its time and candour to this exercise. Its logic is deliberately sector-agnostic, and I have no doubt that it can, in time, inform the self-reliance agenda in solar, storage, and other clean energy value-chains as well.

I hope this brief prompts a more precise and constructive conversation between industry and government on what self-reliance truly requires, and on how we sustain the policy support needed to secure it.



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2019 | *India Cooling Action Plan*
2021 | Net Zero by 2070
2022 | *Mission LiFE*
2022 | *National Bioenergy Programme*
2022 | E-waste (Management) Rules
2023 | G20 Green Development Pact
2023 | *National Green Hydrogen Mission*
2024 | Green Steel Taxonomy
2024 | *PM Surya Ghar Yojana*
2025 | *National Critical Mineral Mission*
2025 | Rajya Sabha Guidelines on Crop Residue Burning
2025 | India's Carbon Credit Trading Scheme (CCTS)
2025 | IFSCA's Framework for Transition Bonds
2026 | Disaster Risk Index for 16th Finance Commission
2026 | India's NDC 3.0
2026 | India's Scenarios towards Viksit Bharat and Net Zero

STATE

2022 | *Rajasthan Organic Farming Mission*
2022 | *Jharkhand State Solar Policy*
2022 | *Uttar Pradesh Vidyut Sakhi programme*
2023 | *Rajasthan Renewable Energy Policy and Green Hydrogen Policy, 2023*
2023 | *Uttarakhand Solar Policy*
2025 | Green Odisha Initiative
2025 | *Maharashtra Climate Action Plan 2.0*
2025 | *Delhi Clean Air Action Plan*
2026 | *Delhi EV Policy 2.0*
2026 | Bihar Promotion of New and Renewable Energy Sources
2026 | Gujarat Integrated Renewable Energy Policy and Green Hydrogen Policy
2026 | *Uttarakhand Mukhyamantri Saur Swarojgar Yojana*
2024-26 |
Directives of Commission on Air Quality Management
Net Zero Roadmaps (BH, GJ, TN, UK)
Agroforestry Roadmaps (AS, MH, OD)
140+ Heat Action Plans (GJ, MH, OD, TN)
Treated Used Water Reuse Plans (MH, UP)
Flood Risk Mitigation Plans (GJ, MH)

21 STATES SUPPORTED

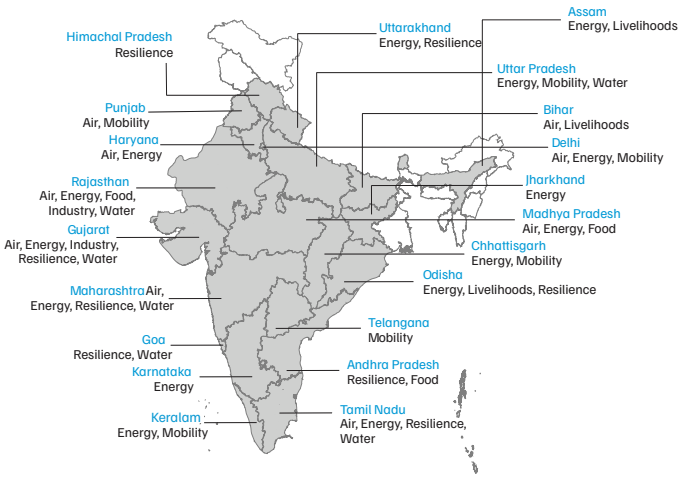



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Executive summary

The supply chain disruptions across different clean energy technologies have urged countries globally to deepen indigenisation in manufacturing and become self-reliant. It is also seen as a measure to strengthen energy security and boost economic growth. However, often, **it is unclear what it truly means to be indigenous.** For instance, does manufacturing the final product locally, while importing the sub-components from outside qualify as being indigenous? How would it compare with a scenario where all components and sub-components are manufactured locally but the intellectual property (IP) around the processes and machines is restricted? Or a scenario where the IP is accessible but the skills and execution capability is locked in foreign talent? A policy that supports domestic manufacturing may be designed depending on what scenario may be preferred keeping a pragmatic view on what may be possible in the short to medium term. **Each of these pathways may serve a different purpose and result in certain trade-offs.**

Our review of the existing manufacturing policies across countries finds that more often, **policies track cost parameters** (such as domestic value added) or **rules of origin** to assess indigenisation levels. Only in a few cases, these cost-based approaches are combined with non-cost economy-wide criteria like local employment and regional investment (Beiter 2022; Department of Finance, Australian Government 2025).

Objectives

In a geopolitically volatile world, **a narrow approach to assessing indigenisation**, such as by focusing on domestic value added, **could lead to structural vulnerabilities** on technology, machines or human capital. At the same time, taking a more holistic view could help us identify blind spots in the supply chains and design specific interventions (policy, regulatory or market) to overcome those vulnerabilities gradually. This issue brief aims to spark **deliberate discussions** among the different stakeholders on **how India should think about assessing indigenisation levels in manufacturing industries**.

By focusing on the wind industry as an entry point, this brief presents a framework with distinct pillars and levels to assess indigenisation. However, the approach is well replicable beyond wind, offering a template for other clean-energy manufacturing value chains, such as solar and battery storage, that face similar definitional ambiguity. It is important to clarify that the brief **does not define indigenisation or recommend a target but provides a structure for discussions** that will potentially guide a definition for the sector. Following the publication, we hope to identify the baseline of the sector which can then help guide policies for increasing levels of indigenisation. In the absence of frameworks, it may be difficult to identify the best component to prioritise for local manufacturing.

The framework is a **result of extensive literature review of Indian and international policies across different sectors that focus on indigenisation, supplemented with structured discussions with seven wind component manufacturers, covering both Indian-owned firms and Indian subsidiaries of foreign companies.**



Image: IWTMA

Key findings

As part of this framework, we have developed five pillars to assess indigenisation (Table ES1) and four levels to track progress (Table ES2). Each Approved List of Models and Manufacturers (ALMM) component in a wind turbine (such as tower, gearbox, blade, generator, and bearings) is screened on these pillars to come up with its own definition of the level (See Annexure I on the website for more details).

Table ES1. The five pillars for assessing indigenisation

Pillar	Definition
Domestic value addition	Assesses how much of a component's value is genuinely created within India, tracing raw materials to the finished part.
Machinery and equipment	Assesses whether the machinery and equipment are owned and operated by an Indian entity, without requiring foreign approval.
Intellectual property and technology	Assesses whether the design, engineering, and technology are owned by an Indian entity, with the freedom to build, modify, or certify it without foreign consent.
Skills and capability	Assesses whether the people who design, engineer, and improve a component are based in India and hold senior, decision-making roles.
Capital	Assesses whether the entity's access to finance is secure and free of external control, so that production remains uninterrupted.

Source: Authors' analysis.

These five pillars – domestic value addition, machinery and equipment, intellectual property and technology, skills and capability, and capital – are interdependent and collectively necessary. It is because self-reliance is not determined solely by where production occurs, but by how control is distributed across design, ownership, financing, operation, and innovation functions over time.

Across each pillar, the levels are defined by how indigenisation will progress over time; starting from Baseline to Level 3.

Table ES2. Four levels to track indigenisation

Levels of indigenisation	Description
Baseline	Assembled in India from imported sub-assemblies, with machinery, design, skills, and financing all foreign-controlled.
Level 1	Manufactured in India but remains dependent on imported critical inputs, with core design, senior technical roles, and capital expenditure dependent on foreign approval.
Level 2	Where import substitution is underway, with Indian entities gaining ownership of machinery, co-design rights, senior technical roles, and a growing share of capital.
Level 3	Fully manufactured, owned, designed, staffed, and financed within India, with no foreign approval required at any stage.

Source: Authors' analysis.

The levels measure the degree of domestic control over a component; but do not prescribe the level each component should reach. Level 3 is therefore not the appropriate policy target for every component. Setting the desired level is a separate policy judgement, and three considerations can inform it. The first is **strategic criticality**, meaning the national and economic security risks that would arise without domestic capability. The second is **economic feasibility**, meaning how well-placed Indian firms are to compete in, and capture the value of, the component industry. The third is the **availability of reliable supply from trusted partner countries**. Together, these considerations indicate whether a component should aim for full domestic capability, partial localisation, or resilient diversification.

How can the government and industry use the framework?

By providing distinct pillars and levels at the sub-component level, this framework gives government and industry a common frame to have active discussions on assessing the current levels and design policies that will encourage indigenisation. Ministries can apply the framework to assess and reflect on how self-reliant the wind sector is as a whole, evaluate pain points to be addressed through future policies, and evaluate individual firms against the pillars where eligibility for incentives or certification is being determined. Companies can self-assess to map out the structural vulnerabilities and identify specific areas where targeted policy support is needed. These assessments and subsequent discussions among the key ministries and departments should potentially guide a sector-specific definition of indigenisation for the wind industry and the subsequent design of the policies.



Image: IWTMA

Assessing indigenisation for each component separately helps stakeholders identify specific gaps that inform targeted policies.

1. From globalisation to localisation: The case for defining *Atmanirbharta*

Several disruptions and economic shocks—such as the pandemic, wars, and supply chain disruptions—have nudged governments across the world to introduce inward-looking industrial policies.

In India, the sentiment of *Atmanirbharta* has been ingrained since the 1905 Swadeshi Movement, which promoted the consumption of indigenously made goods over British goods. Post-independence, this sentiment was found in five-year plans, and then evolved into the *Atmanirbhar Bharat* policy in 2020, in response to pandemic-driven supply chain disruptions (Planning Commission, Government of India 2003; PIB 2020).

Currently, various stakeholders such as ministries and industry adopt divergent interpretations of *Atmanirbharta*, resulting in fragmented approaches. For instance, the Defence Acquisition Procedure-2020 (DAP) tests for design and ownership sovereignty under the Buy (Indian-IDDM) category, while the MNRE's solar manufacturing schemes test for manufacturing location (where a product is made), rather than who designed it (Ministry of Defence 2020; Rajya Sabha 2024). Divergent criteria for indigenisation create ambiguous understanding. Designing a structured framework that can help define self-reliance can allow us to reflect on the existing policies and also help in designing new ones to address the sector's blind spots.

While the larger framework for *Atmanirbharta* can be sector-agnostic, the parameters to evaluate it would be sector-specific. The brief tries to develop a methodology specifically for the Indian wind sector, given its high local content and complex multi-part supply chain. We hope and expect that the learnings from this can be used to develop similar frameworks for other sectors.

As of 30 September 2026, India's installed wind capacity stood at 59.20 GW (MNRE 2026b). India ranks fourth globally in installed wind capacity, with around 28 GW of additional capacity under implementation, and annual wind turbine manufacturing capacity reached about 24 GW by March 2026 (PIB 2026). Annual capacity additions reached a record 6.05 GW in FY 2025–26, 46 per cent higher than FY 2024-25 (MNRE 2026b; PIB 2026). Against this scale, the sector's headline indigenisation figure of 70 to 80 per cent across key components such as towers, blades, and gearboxes can mask persistent dependence in specific high-value inputs, such as balsa wood or carbon fibre (PIB 2026).

Such figures conceal two further distinctions that matter for policy. The first is whether domestic activity reflects genuine manufacture, or only the assembly of imported sub-assemblies. The second is whether domestic value represents the domestic control of machinery, technology, intellectual property, and capital, which need not move together. A foreign-owned subsidiary may run a full-scale, high-quality plant staffed almost entirely by Indian engineers while design authority and research leadership remain with its overseas parent, whereas an Indian-owned firm may rank highly on intellectual property and capital by virtue of ownership alone. Such scenarios may not be visible in the overarching indigenisation figure, which might signify the same policy conclusions even when the underlying reality on the ground is different.

Existing indigenisation policies in the wind sector focus on different concepts. The Approved List of Models and Manufacturers (Wind) (ALMM-Wind) certifies domestic sourcing for wind turbine components, the standard operating procedure for ALMM-Wind and ALMM-WTC certifies the testing and performance validation, and the Wind Turbine

Materials and Resources Utility Tracker (WT-MARUT) launched by the MNRE provides supply chain transparency (MNRE 2025a, 2025b, 2026a). These policies certify location, approved-list sourcing, and the formal presence of testing and R&D, but they do not ask whether the design itself is owned in India. A component can meet every stated requirement, even while the domestic control it is meant to signal may remain outside the country. For instance, Indian blade manufacturers have developed indigenous designs and machining capability, but they continue to import balsa wood and carbon fibre, the two inputs on which blade performance most depends.

This gap needs to be addressed to strengthen the sector and make it resilient to supply chain shocks. Defining *Atmanirbharta* for the wind sector thus calls for a measure that reflects a holistic perspective of the realities of the sector. This brief seeks to address this issue by developing a sector-specific, evidence-led definition of *Atmanirbharta* for India's wind manufacturing sector, one that can inform more coherent policy design and provide a replicable approach for other clean-energy value chains facing similar definitional uncertainty.

1.1 Three questions anchor a principles-based framework

This issue brief proposes a principles-based framework for defining and assessing *Atmanirbharta* of India's wind manufacturing sector. The brief is guided by three questions:

- Which parameters and principles are essential to build the framework that could inform the definition of *Atmanirbharta*?
- How do we define these parameters that reflect the realities of the wind sector?
- How can progress towards self-reliance be expressed in the framework?

These questions guide how the brief structures the framework, defining pillars and setting out the levels through which a component can progress towards *Atmanirbharta*. Together, they give the government, manufacturers, and industry a common basis to measure the level of indigenisation. In doing so, they lay the groundwork for consensus-driven definition of *Atmanirbharta* to be used while framing policies. Building on these questions, we devised a three-step methodology to construct the framework: literature review, stakeholder consultations, and framework design. The next section explains these phases.

1.2 A framework developed in three stages

The research was undertaken in three stages as explained below:

The *first stage* involved a structured comparative review of India's policy landscape as well as international policies and practice across sectors to assess how indigenisation has been defined, operationalised, and measured. This includes analysing the use of standardised definitions, metrics, and terminology in policy and regulatory instruments such as 'local content requirements' and 'domestic content'. Another aim was to identify the part of the value chain at which self-reliance is assessed, whether at the level of the final product, or through aggregation of sub-components. This review established the pillars, components, and levels along which *Atmanirbharta* in the wind sector could be assessed.

The *second stage* involved stakeholder consultations, testing the pillars identified through the literature review against on-ground realities, evaluating where the proposed pillars and levels hold. The consultations also looked at where the definitions required edits, by deep diving into each component and sub-component in the wind supply chain.

In the *final stage,* we translated the insights from stakeholder consultations into a finalised framework. In this phase, we set the boundaries of assessment at the component level rather than the final product level. We defined the pillars along which each component is assessed, and specified the levels of the maturity scale.

Limitations: There are a few limitations to the study. The framework was developed and tested through consultations with a selected set of wind component manufacturers. This selection does not entirely represent the wind sector as a whole. As the consultations were limited, the definitions of the pillars and levels may change as the realities of the sector become clearer over time. The framework is not a mandated standard but a diagnostic tool that each manufacturer and policymaker can apply to its own circumstances.

2. Understanding existing approaches to indigenisation

We analysed several domestic and international policies, including public procurement frameworks, customs and free-trade zone regulations, sector-specific manufacturing and localisation schemes, and wind-specific policies (on-shore and off-shore). We undertook these analyses to understand how different policies were approaching and quantifying indigenisation. The scope of the review includes any policy instrument that referred to indigenisation, local content, or domestic value addition (the terms most closely equivalent to *Atmanirbharta* across jurisdictions) regardless of whether it applied directly to the wind sector. The review looks at formula-based, points-based, and other qualitative descriptions of *Atmanirbharta*. The resulting analyses produced the pillars against which *Atmanirbharta* can be quantified, forming the analytical basis for the framework.

2.1 Cost and value-based approaches to define indigenisation

Policies built around local content are the most widely used method for quantifying indigenisation.

India's *Public Procurement (Preference to Make in India) Order, 2017,* known as the PPP-MII Order (DPIIT 2017) defines local content (LC) as:

LC (%) = (total value − value of imported content) ÷ total value × 100

This calculated local content is used to classify suppliers into three categories:

- Class-I: ≥50 per cent;
- Class-II: ≥20 per cent to <50 per cent; and
- Non-local:<20 per cent.

It excludes (i) imported items sourced through resellers or distributors, along with license fees, royalties, and technical charges paid outside India, and (ii) repackaged, refurbished, or rebranded goods.

A parallel bill of materials formulation is used elsewhere in Indian policy, calculating local content as the domestic share of total bill of materials cost (Ministry of Textiles 2019). Customs and Special Economic Zones (SEZ) regulations introduce a parallel value-addition requirement to determine eligibility for fiscal exemptions. For instance, under Customs Notification No. 11/2026-Customs (Department of Revenue 2026), units operating in SEZs must demonstrate a minimum value-addition of 20 per cent for goods cleared into the domestic tariff area (DTA).

Domestic value addition (DVA) is another related term to assess *Atmanirbharta* based on value addition in monetary terms. India's *Domestically Manufactured Iron & Steel Products Policy (DMI&SP), 2025* uses the DVA synonymously with local content, but expands the scope to include technological ownership and embedded capability (Ministry of Steel 2025). Under this framework, 'indigenous technology' is defined through a combination of ownership, intellectual property, and capability criteria. These include majority Indian equity ownership (at least 51 per cent), domestic ownership or licensing of intellectual property, and the localisation of core engineering, R&D, and execution functions.



Image: IWTMA

Cost-based local content formulas show where money is spent on a component but not who controls the technology behind it.

The same underlying logic—cost of domestic content as a share of total cost—recurs internationally. In the United States, the Buy American Act (BAA), 1933, applies a two-part test for manufactured end products (General Services Administration 2026; United States Government Publishing Office 2011): the product must be manufactured in the United States, and the cost of US-origin components must meet a specified threshold relative to total component cost. The policy sets a phased domestic-component-cost threshold—65 per cent rising to 75 per cent by 2029—with a stricter 5 per cent foreign-content cap for iron and steel, reinforced through price-preference mechanisms in federal procurement.

These requirements are extended under the Build America, Buy America Act (BABAA), 2021, to federally funded infrastructure projects, covering iron and steel, manufactured products, and construction materials (United States Congress 2021). Manufactured products are subject to a minimum 55 per cent domestic component threshold.

China adopts a similar cost-based formulation under its Government Procurement framework (General Office of the State Council 2025), where domestic content thresholds are prescribed by the Ministry of Finance, with implementation typically subject to transition periods of 3–5 years. Free trade agreements, including the India-UAE CEPA, India-EU FTA, and EU-UK trade and cooperation agreement apply an equivalent logic through rules-of-origin formulas (Value of Non-Originating Materials[1] and Qualifying Value Content[2]), typically requiring 40 per cent or more value addition (Government of the Republic of India and Government of the UAE 2022; European Commission, n.d.).

[1] The customs value, at the time of importation, of materials, parts or inputs used in producing a good that do not originate within the territory of the parties to the trade agreement.

[2] The minimum share of a good's free-on-board (FOB) value that must consist of originating (domestic or regional) content for it to qualify for preferential tariff treatment under a trade agreement.

These formulas may look similar but they are not interchangeable; they differ in three aspects. One, on what counts as an eligible 'domestic' input; two, the point in the supply chain at which value addition is measured; and three, in whether compliance is enforced through binding thresholds or price preferences. This matters for the wind sector because a component can register a high local-content score under one formulation while remaining substantially import-dependent under another, depending on how licensing fees, imported sub-assemblies, or reseller margins are treated. For example, according to stakeholders, gearbox manufacturers in India are predominantly subsidiaries of foreign parent companies. Under a formula that measures only the domestic share of assembly cost, a gearbox assembled in India can score highly, even where its core gears operate under a foreign manufacturing license.

Origin-and-process-based frameworks, such as Singapore's substantial-transformation test and Switzerland's 'Swissness' rules, combine value thresholds with defined production processes, meaning a product can fail to qualify as domestic even if it meets a value threshold, if the underlying transformation process was not substantially carried out domestically (IPI, n.d.; Singapore Customs 2026). This is analytically close to India's own solar domestic content requirement for cells made from black wafers, which uses a qualitative manufacturing-origin test rather than a percentage formula (MNRE 2019).

Another consequential pattern is the gradual extension of formula-based frameworks beyond value addition, towards ownership and technological control. India's Domestically Manufactured Iron and Steel Products Policy (DMISP), 2025 retains the standard value-addition formula, but layers on additional ownership and IP criteria before a technology qualifies as 'indigenous' (Ministry of Steel 2025). This same shift is visible directly in the wind sector: the ALMM-Wind/ ALMM-WTC framework requires data sovereignty, domestic operational control, and localised R&D and manufacturing infrastructure, extending well beyond a conventional cost-based calculation (MNRE 2025b). A similar logic appears outside wind, in the requirement that energy management system software for battery storage projects be developed indigenously, regardless of its (small) share of total project cost (Ministry of Power 2025a, 2025b). In each case, the underlying rationale is the same: a cost-based formula can capture where expenditure occurs, but not where strategic capability or control resides. Each sector or policy has responded by testing for different dimensions of self-reliance. The framework set out here draws on these varied dimensions, consolidating them into a consistent language that can be applied across sectors, capturing self-reliance from several perspectives.

Tracking value addition in monetary terms is a useful metric to assess *Atmanirbharta*, but it cannot stand alone. Countries have realised that control of technology and skills is equally important, and have added ownership, IP, and control conditions as a supplementary layer rather than replacing the formula outright. Few countries have looked at self-reliance by bringing together such holistic factors that supplement value addition. This can be observed in the following section.

2.2 Points-based and competitive approaches to localisation

A second approach to assess *Atmanirbharta* includes combining non-price criteria with price criteria in a competitive evaluation. Points-based systems represent an alternative to fixed thresholds, including local content as one weighted factor within a broader approach than a pass/fail condition.

Japan uses this method for its offshore wind procurement, where it emphasises wider economic benefits of local manufacturing by including regional employment, domestic investment, and engagement with local authorities (Beiter 2022). Local content is therefore incentivised through scoring rather than prescribed through minimum thresholds. Similarly, Australia's *Buy Australian* framework rewards economic benefit to the Australian economy within the value-for-money assessment for procurements above AUD 1 million (Department of Finance, Australian Government 2025). The domestic benefits include local employment, ensuring skills and capability development, subcontracting, and supply chain development.

Another method is prioritising domestic manufacture of high value parts in the supply chain (InfoLink Consulting 2023). In 2021, South Korea's framework evaluated offshore wind bids out of 100 points, against the turbine cost structure, weighting the nacelle most heavily, followed by underwater foundations,

blades, towers, and cables, with a minimum 50-point threshold required to access additional renewable energy certificates (InfoLink Consulting 2023; KEA, n.d.). Taiwan's procurement framework permits localisation commitments to count for up to one-third of the total tender evaluation score (Public Construction Commission 2019). In practice, this allows domestic suppliers meeting specified value addition thresholds (e.g., ≥50 per cent) to remain competitive even where bids are marginally higher in price, within defined limits.

A points-based or weighted approach offers useful flexibility for prioritising among components, but the weighting methodology needs to be transparent and defensible, given the precedent of such weights being challenged or reversed elsewhere.

In some cases, localisation is embedded in a competitive evaluation rather than as a fixed percentage threshold or points-based scoring. For instance, the UK's Clean Industry Bonus rewards offshore wind developers who commit to shorter and sustainable investment in UK supply chains, rather than mandating a local content percentage (Department for Energy Security and Net Zero 2026). Implicit addition of localisation can be found in the EU's procurement rules, where the procurement agency relies on the 'most economically advantageous tender' criterion for tender evaluation (SIGMA 2011). This is identified by ranking bids against price or life-cycle cost together with quality criteria such as technical merit, environmental performance and social value. However, sector-specific provisions introduce implicit localisation. For example, in utilities procurement, contracting authorities may reject bids where more than 50 per cent of the product originates from non-EU countries or may prefer EU-origin bids where the price difference does not exceed 3 per cent (European Parliament and Council of the European Union 2014).

> Localisation can be rewarded through scoring, without fixing a local content percentage.

Investment-linked conditions go further. The EU's proposed Industrial Accelerator framework requires foreign investors to satisfy at least four of six conditions (European Commission 2026). These include caps on ownership or voting rights (49 per cent), mandatory IP licensing or joint ownership, minimum R&D reinvestment, and minimum domestic workforce shares, treating 30 per cent or more ownership or voting rights as sufficient to establish 'control' over an entity. This is a materially different logic from a cost-based formula: it defines self-reliance in terms of decision rights and technology access rather than the geography of expenditure.

These examples show that procurement-linked localisation can operate effectively without a local content percentage threshold. This is relevant for components such as blades, where a large share of value is entirely import-dependent, and a wind-sector-specific cost formula may be difficult to construct.

Taken together, the literature review indicates a broad and consistent evolution to define *Atmanirbharta*. Cost-based value-addition formulas remain the dominant and most implementable tool, but jurisdictions moving into more technologically sensitive or strategically sensitive sectors have found it necessary to complement that tool with ownership, IP, and control-based conditions.

3. Building the framework for *Atmanirbharta*

The literature review highlights a consistent issue: while indigenisation is widely measured, these measurements do not fully capture where strategic dependence is located within the value chain. They also do not distinguish between areas where strategic dependence can be reduced, and those that are structurally constrained by technological, economic, or geographic factors. As a result, existing frameworks offer limited guidance on a policymaker's actual questions: what can be strengthened domestically? What is likely to remain externally dependent? Where should complementary capabilities be developed instead?

This gap exists because of three specific limitations in how indigenisation is currently measured:

A reliance on single metrics that measure expenditure rather than control. Most frameworks express DVA as a share of total cost. While this provides clarity and ease of implementation, it does not account for where control resides within the value chain. As a result, products can meet high local content thresholds while continuing to depend on imported technology, critical components, or foreign intellectual property. **More fundamentally, this reflects a broader issue: localisation is often treated as a compliance metric rather than a pathway to building capability**. Meeting a threshold becomes an end in itself, even where the underlying technological dependence remains unchanged.

This distinction between capacity and capability recurs at the level of policy design more broadly: frameworks have largely prioritised the expansion of manufacturing capacity, factories, assembly lines, and output, without adequately capturing whether firms exercise control over design, engineering, or innovation. In the absence of this shift, localisation risks remaining assembly led rather than capability driven.

An uneven distribution of strategic weight across the value chain, which single, aggregated metrics cannot bring to the surface. Indigenisation at the level of final assembly often masks continued dependence upstream. For example, domestic assembly of turbines does not imply localisation of high-value components such as nacelle or specialised materials. This points to a related concern—not all segments of the value chain carry equal strategic weight. Dependence on a small set of high-value or critical inputs can create disproportionate vulnerabilities, even where overall DVA appears high.

Structural leakages that allow measured indigenisation to overstate actual domestic capability. In practice, firms can meet local content requirements through workarounds. For instance, a component manufacturer can source raw materials from a third-party vendor in India, who imports the same materials from a foreign country and claims it as domestically sourced. These can be understood as 'leakages'. If unaddressed, such leakages can lead to a systematic overstatement of domestic capability, undermining the reliability of any indigenisation figure as a guide to policy.

Taken together, these limitations indicate that *Atmanirbharta* cannot be meaningfully defined through a single metric or threshold. Instead, it must be understood as a multi-dimensional construct, one that captures not only where production takes place, but how control over technology, machinery, skills, and capital is distributed across the system, and where in the value chain that distribution matters most.

> Leakages, such as an Indian vendor supplying imported material as domestically sourced, can systematically overstate domestic capability.

Building on this understanding, the brief develops a conceptual framework that can potentially inform the definitions and targeted policies for *Atmanirbharta* in the following manner.

- First, the framework defines the pillars along which *Atmanirbharta* is assessed. The framework draws on key dimensions that came across in the literature review, moving beyond value of the product towards a set of indicators that reflects resilience, namely DVA, machinery and equipment, IP and technology, skills and capability, and capital. The definitions of the pillars are defined in such a way that they address the leakages identified up until now.
- Second, it sets the boundaries of measurement. Rather than assessing the final product—the wind turbine—the framework assesses major components, namely blade, tower, gearbox, generator, and bearings.
- Third, the framework establishes levels that chart progression towards *Atmanirbharta*. These levels describe how a firm can advance along each dimension, and where policymakers can direct interventions to support that progression as needed.

The following sections discuss each of these stages in detail.

3.1 Five pillars lay out the dimensions for *Atmanirbharta*

To translate these design principles into an operational model, this brief proposes a five-pillar framework that captures the core dimensions of industrial self-reliance. Rather than treating *Atmanirbharta* as a single threshold, the framework conceptualises it as a distribution of control and value across the manufacturing system—spanning production, ownership, technology, skills, and finance. These pillars are DVA, machinery and equipment, IP and technology, skills and capability, and capital (Table 1).

Together, these pillars provide a structured basis for designing procurement rules, incentive schemes, and investment conditions aligned with *Atmanirbharta* objectives.

These five pillars are interdependent and collectively necessary, as industrial self-reliance is not determined solely by where production occurs, but by how control is distributed across design, ownership, financing, operation, and innovation functions over time.

Table 1. The five pillars of *Atmanirbharta*

Pillar	Definition
Domestic value addition	Assesses how much of a component's value is genuinely created within India, tracing raw materials to the finished part.
Machinery and equipment	Assesses whether the machinery and equipment are owned and operated by an Indian entity, without requiring foreign approval.
IP and technology	Assesses whether the design, engineering, and technology are owned by an Indian entity, with the freedom to build, modify, or certify it without foreign consent.
Skills and capability	Assesses whether the people who design, engineer, and improve a component are based in India and hold senior, decision-making roles.
Capital	Assesses whether the entity's access to finance is secure and free of external control, so that production remains uninterrupted.

Source: Authors' analysis.

The pillars are defined as follows:

- **Domestic value addition**: This pillar measures the extent to which economic activity and value creation are retained within the domestic economy. It is traced through both the immediate sub-assemblies that form a component (n-1 inputs) and the constituent materials from which those sub-assemblies are made (n-2 inputs), rather than the final assembly step alone. The use of materials includes the following:
    - The n-1 input is the immediate sub-assemblies brought in or fabricated to build the final component, one processing step removed from it.
    - The n-2 input is the constituent materials or parts that go into those n-1 sub-assemblies, two processing steps removed from the final component. For instance, this will include steel scrap, special grade alloys (like chromium, nickel, molybdenum), electronic steel/ laminated steel (grain-oriented vs non-grain oriented), copper, permanent magnets.
- **Machinery and equipment**: This pillar evaluates whether the physical productive assets used to manufacture a component, especially its critical machinery or equipment, are genuinely in domestic hands. It essentially indicates that production can be operated freely and cannot be halted, withdrawn, or overridden by a foreign party. It assesses this from two perspectives:
    - Held under clean domestic legal title, free of any foreign lien[3] or mortgage. Owned by an Indian entity with no foreign creditor having a claim over the asset.
    - Subject to domestic decision authority, covering day-to-day operations, repair and maintenance, and capital expenditure. None of these decisions should require foreign approval, whether that approval arises from equity ownership, a board representation, or a separate contractual arrangement such as a management, franchise, technology supply or off-take agreement.
- **Intellectual property and technology**: This pillar assesses who owns the core technical design, engineering methodology, and certification basis for the component, rather than merely licensed. The domestic entity should have the freedom to operate, meaning it should be able to manufacture, modify, independently certify, export, and sublicense the design without requiring a foreign IP-holder's consent. Where a component contains embedded software or firmware, this pillar applies the same ownership and control tests to that code.
- **Skills and capability**: This pillar assesses whether the human capacity to design, engineer, certify and improve a component resides within the country. The capacity to operate, assemble, and maintain it resides in personnel who are physically present in, employed by, and producing the product within the country. The pillar weighs the capacity by the seniority of the role and decision-making criticality of their role. It verifies the capacity over time through sustained retention of staff in a related technical role, rather than by training inputs, certificates issued, or raw headcount.
- **Capital**: This pillar assesses whether a manufacturing entity's access to finance is secure enough to sustain production and continued investment. It asks three questions. The first is whether any external financier holds effective veto or withdrawal rights over operating or investment decisions. The second is whether refinancing or payment shocks, including royalties, profit repatriation, debt service, lease payments, and deferred vendor payments, could interrupt production. The third is whether sufficient long-term capital is available for continued investment and upgrading.

With the five pillars defined and the component established as the unit of assessment, what remains is a means of expressing how far self-reliance extends within each pillar. *Atmanirbharta* is not a binary condition: a component is rarely either wholly import-dependent or wholly self-reliant, and typically occupies an intermediate position that evolves over time. Rather than reduce each pillar to a single pass-or-fail threshold, the framework grades it along a graduated scale.

[3] A lien is a right to retain or claim an asset until a debt is satisfied.

The following section sets out this scale, describing the levels through which a component advances—from import dependence towards full domestic control—and explaining how these levels allow firms and policymakers to locate current capability and identify where further effort is needed.

3.2 Four levels trace the move from foreign to domestic control

The framework captures several dimensions of self-reliance. A component-wise structure was the necessary next step: the same five pillars, now scored separately for five components across the baseline and three levels.

The scale does not measure a percentage of local content—it describes who controls a component, and it is read separately for each of the five pillars, so that the same level carries a slightly different meaning from one pillar to the next. The current levels are calibrated to the wind sector, defined after consultations with wind manufacturers to ground them in reality. Beneath a baseline category sit three levels, tracing the move from assembly in India to manufacturing that is genuinely Indian-controlled.

- **Baseline:** The component is only assembled in the country, from imported sub-assemblies. Machinery, design, and financing are all foreign. A domestic presence of this kind signals limited domestic capability, with domestic activity limited to assembly.

- **Level 1:** The n-1 sub-assembly is manufactured in India, but one or more critical n-2 inputs (including raw materials) remain imported, and no explicit effort is made to reduce that dependence. The ownership of machinery and equipment remains with the domestic entity, along with operating and permissions to run them. Some dependency on core design and engineering elements remains on foreign companies, but major skills and skill-sets remain domestic or are transferable. Some key designing positions, senior engineering and R&D leadership are still held outside India. Capital is predominantly foreign, capital expenditure depends on a foreign financier's approval, transactions are denominated in both INR and foreign currency, profit is repatriated to foreign parent companies.

> This framework aims to serves as a common frame to guide discussions that will potentially inform defining indigenisation.

- **Level 2:** Alongside n-1 component manufacturing, all n-2 inputs are domestically sourced, with exceptions only for inputs demonstrably unavailable in India, and the company is actively working to reduce import dependence. There is dependency on parent or other foreign companies in sourcing machinery and equipment, but the eventual ownership and day-to-day decision-making lies with the domestic entity. The domestic entity holds co-design rights some core design and certification basis remain foreign-held. The local-to-foreign worker ratio improves with increased domestic skill and capabilities to lead senior design and engineering roles. Capital is balanced in ways such as joint ventures or foreign subsidiaries with Indian equity participation. Capital transactions are a mix of INR and foreign currency denominated, and some profit is retained and reinvested domestically. Major new investment may still need a foreign financier's approval.

- **Level 3:** Both n-1 and n-2 inputs are fully manufactured or sourced from India, and the domestic entity fully owns and controls physical assets as well as intangible assets, design, and IP rights. Employees are fully trained to lead R&D and innovation independently, and a mature talent pool exists within the domestic entity for the component's specialised skills. Capital is well-balanced, with transactions taking place in INR denomination, secure long-term finance with no foreign approval required and the profits are retained and reinvested in India.

These level descriptions apply across all five components assessed under the framework. Together, the five pillars and these levels constitute the framework for assessing *Atmanirbharta* in the wind sector. Applied to each component in turn, they replace a single value addition threshold with a structured and comparable measure of how far control over a component's value, assets, technology, skills, and capital genuinely rest in domestic hands. This provides the common basis, so far absent, on which the sector's current position can be established and its progress tracked over time.

4. Conclusion and way forward

This brief has set out a framework for defining and measuring *Atmanirbharta* in India's wind turbine manufacturing sector. In doing so, it gives government and industry a common, component-level basis on which to judge where the sector stands, and where support is most needed. The scale describes how far domestic control extends. It does not prescribe how far it should extend for each component.

As each pillar points to a different policy lever, different ministries can use the analysis to find their own entry point into the sector.

- **The Ministry of New and Renewable Energy** can use the end-to-end supply chain analysis to bring targeted policies in the wind sector.
- **The Ministry of Commerce and Industry** can use the DVA pillar to inform trade and customs measure for critical inputs that requires stronger supply chains.
- **The Ministry of Heavy Industries** can use the machinery and equipment pillar to identify where the sector remains import-dependent for heavy machinery, and promote the adoption of domestic alternatives.
- **The Ministry of Skill Development and Entrepreneurship** can use the 'skills' pillar to target training at the specific roles where domestic staff are confined to execution rather than design or R&D leadership.

The framework is a diagnostic tool, not a mandated standard—each manufacturer can apply it to its own circumstances rather than treat it as a compliance requirement to meet. The government can use it both to gauge where the sector stands, and where targeted policies are required.

> As each pillar points to a different policy lever, different ministries can use the framework to find their own entry point into the sector.

It is also a foundation rather than a finished instrument. We developed and tested it through consultations with seven component manufacturers, which are not representative of the sector as a whole, so the pillar and level definitions are likely to need further iteration as the framework is tested more widely and the realities of the sector become clearer.

The next step is the application of the framework. A further step, between diagnosis and target-setting, is to assess how strategically important it is to move each component up the scale. Component manufacturers will assess themselves against the five pillars, and these assessments will be aggregated into a sector-wide score. Each pillar currently carries equal weight in the assessment; this may need to be revised as the framework is applied more widely and sector priorities become clearer. The framework will also highlight the challenges and dependencies in the sector that enable targeted policy actions for the sector. The framework should be revisited once in three years to accurately reflect the realities of the sector. It is also intended to be replicable for other clean energy value chains, such as solar and battery storage, which face the same policy ambiguity.

Acronyms

ALMM-Wind	Approved List of Models and Manufacturers – Wind
ALMM-WTC	Approved List of Models and Manufacturers – Wind Turbine Components
BAA	Buy American Act
BABAA	Build America, Buy America Act
CEPA	Comprehensive Economic Partnership Agreement
DAP	Defence Acquisition Procedure
DMI&SP	Domestically Manufactured Iron & Steel Products Policy
DTA	domestic tariff area
DVA	domestic value addition
FOB	free on board
FTA	free trade agreement
FY	financial year
IDDM	Indigenously Designed, Developed and Manufactured
IP	intellectual property
LC	local content
MNRE	Ministry of New and Renewable Energy
PPP-MII	Public Procurement (Preference to Make in India)
R&D	research and development
SEZ	Special Economic Zone
WT-MARUT	Wind Turbine Materials and Resources Utility Tracker

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