Bharat Cleantech Manufacturing Platform: Financing and Taxation

Accelerating an Aatmanirbhar, Green and Viksit Bharat

bharat CLIMATE FORUM

Council for International Economic Understanding

TRILEGAL

Dalberg

As India rapidly moves towards meeting its NDCs, indigenisation of cleantech manufacturing is critical for an *Aatmanirbhar* and *Viksit Bharat*

India has national targets and projections across renewable energy and e-mobility for 2030…

300 GW Solar *installed capacity*[1]

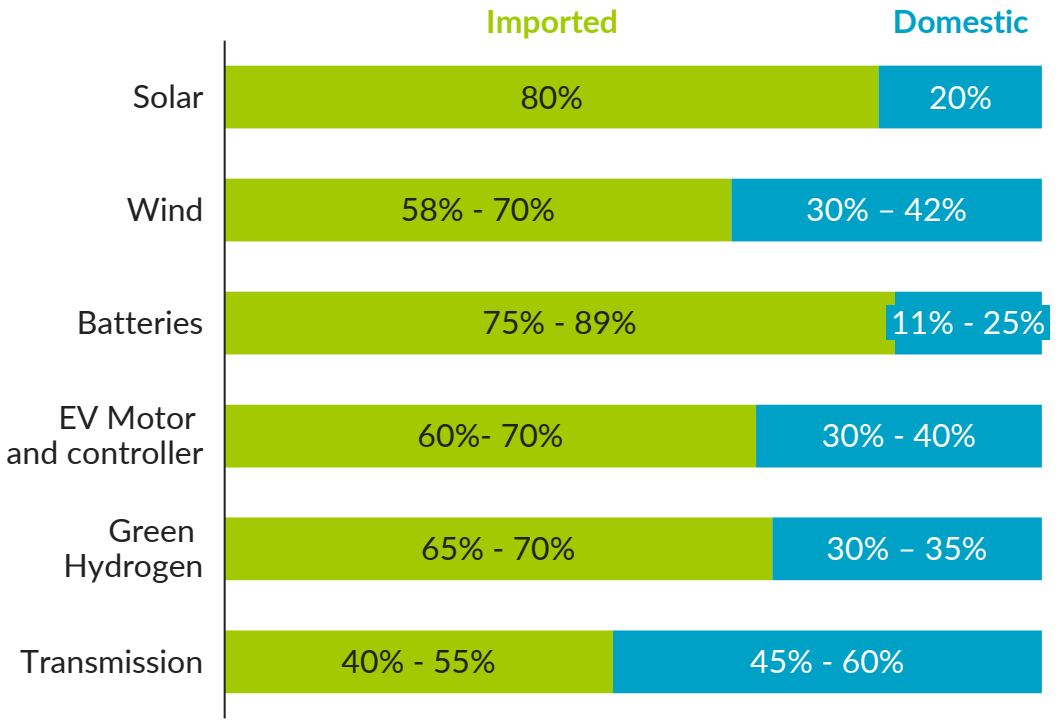
30% EV *sales penetration*[2]

100 GW Wind *installed capacity*[3]

5 MTPA Green Hydrogen *production*[4]

… but cleantech supply chains are heavily import-dependent and need to be indigenised for an Aatmanirbhar Bharat

Cleantech manufacturing import dependence across the value chain, 2023



Source: (1) MNRE; Solar capacity projection extrapolated from CEA's 2032 Solar capacity projections, assuming linear growth in capacity; (2) NITI Aayog ; (3) ET ; (4) MNRE - NGHM; MNRE, Ministry of Power; Economics Times; BNEF's installed and announced capacity; IEA, India – World Energy Investment 2024 – Analysis; NITI, India's Power Sector | Capacity & Generation Mix; PIB, India's Ethanol Push: A Path to Energy Security, CEEW, Strengthen India's Clean supply chain, 2024; Bain, India Electric Vehicle Report, 2023; Policy circle; Economist Impact, Scaling clean energy: financing and transition strategies for India's sustainable future

The Platform could support the National Manufacturing Mission to target at least 50% indigenisation of cleantech manufacturing value chains by 2030 enabling net-zero ambition with indigenous production

The Platform's potential to accelerate development of incremental indigenous capacity can be observed across sectors

Sector-wise goals

	Solar	Wind	BESS	E-mobility	Green Hydrogen	Transmission
Installed capacity						
2030 targets	300 GW[1]	100 GW[2]	230-240 GWh[3]	30@30[4]	5 MTPA[6]	648,190[7] ckm
% value chain indigenisation*						
Current levels (est.)	~20%	~35%	~20%	~35%[5]	~35%	~55%
2030 target (Proposed)	~50%	~60%	~45%	~50%	~60%	~70%

May decline due to shifting and unstable demand of domestic components amid intensified global competition

Note: *Indigenisation is domestic value contribution across cleantech value chain from raw materials to end production for all components; : (1) MNRE; (2) ET; (3) Estimated requirements under National Electricity Plan (NEP) 2023 of CEA; (4) NITI Aayog ; (5) For EV Motors and controllers; (6) MNRE - NGHM (7) 2032 target from National Electricity Plan Volume II – Transmission of CEA

Source: MNRE, Ministry of Power; Economics Times; BNEF's installed and announced capacity; IEA, India – World Energy Investment 2024 – Analysis; NITI, India's Power Sector | Capacity & Generation Mix; PIB, India's Ethanol Push: A Path to Energy Security, NEP 2023 of CEA; EV Reporter, India's electric vehicle supply chain landscape | An overview, 2024

A detailed strategy and action plan for the focus sectors would be developed to achieve these goals and objectives and build the cleantech indigenisation pathways for these sectors

Sector-wise gaps would be identified and addressed with all stakeholders across each cross-cutting theme in alignment with the National Manufacturing Mission

Enablers:
Policy recommendations; Trade partnerships; Public and private stakeholder recommendations; Demand and supply drivers; Leveraging AI for Climate and cleantech manufacturing

Sectors


Solar


Wind


BESS


E-mobility


Green Hydrogen


Transmission

Cross-cutting themes

Demand & Market Architecture	*Drive demand and adoption of output, incl.* ***Quality Control Orders (QCOs)***
R&D & Product Innovation	*Drive technology sharing, adoption and indigenous R&D*
Upstream Raw Materials & Critical Inputs	*Streamline raw material sourcing (e.g. critical rare earth elements; bio-energy feedstock etc.)*
Capital Equipment & Infrastructure	*Address machinery sourcing & infrastructure requirements (e.g., grid connectivity)*
Talent & Workforce	*Bridge skilling gaps for specialised and non-specialised workforce*
Financing & Taxation	*Identify financial instruments and mechanisms to reduce the funding gap Identify levers to improve* ***Ease of Doing Business*** *to attract investments*

Detailed ahead

bharat CLIMATE FORUM

TABLE OF

Contents

Council for International Economic Understanding

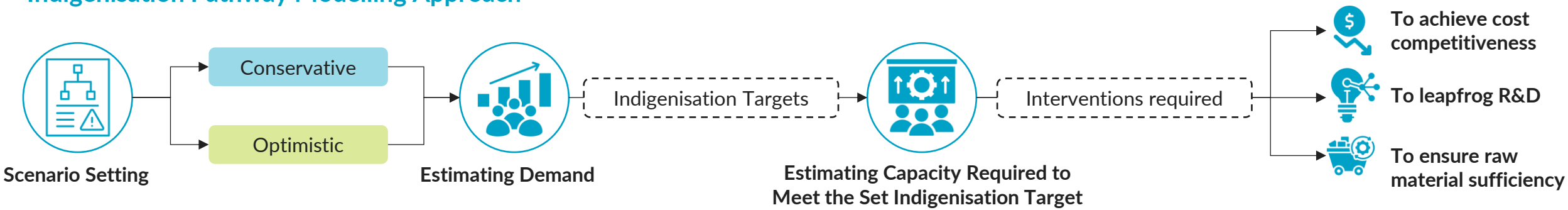
Dalberg

SECTION ONE

CROSS CUTTING THEME: FINANCING

The cleantech indigenisation pathways have been built on two demand scenarios – conservative and optimistic – to identify potential pathways and key enablers to achieve sectoral indigenisation targets (1/2)

Indigenisation Pathway Modelling Approach

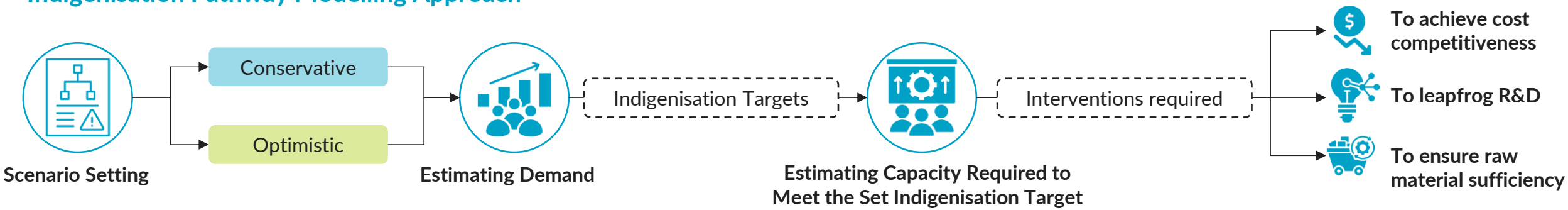


Scenario criteria	CONSERVATIVE SCENARIO			OPTIMISTIC SCENARIO		
	Solar	Wind	Battery	Solar	Wind	Battery
1 Government policy landscape		Upswing in tender activity, top states to meet RAP targets	Extension of ACC PLI and support for implementation		All states meet RAP targets; augmentation of grid at current pace	Extended support to battery manufacturers across value chain
2 Adoption Trajectory	Solar & hybrids meet **70%** of green H_2 energy demand **50%** off-grid & C&I adopt domestic modules	C&I levels expected to increase from current levels	**40 GWh** BESS by 2030 + additional for grid stability; **EV 30@30** to be achieved	Solar & hybrids meet **100%** of green H_2 energy demand **70%** of off-grid & C&I adopt domestic modules	Corporate shift to hybrid power accelerates to meet RE100 by 2030	Coverage of all additional VRE under 2-hour BESS; adoption of E2W/E3W beyond 30@30 goals
3 Export growth	**Africa**: Offer credit to 4 countries on use of Indian modules **US**: Deployment grows at 8% CAGR	**US/Europe/ME & Africa**: Existing share of 15% in global exports to these countries to be maintained		**Africa**: Offer credit to all countries on use of Indian modules **US**: Deployment grows at 10% CAGR	**US/Europe**: Existing share of 15% in global exports to be maintained **ME & Africa**: Increase in total share considered	

Source: MNRE, Physical progress; MNRE, Press release; : ISA, India EXIM bank ; PV Magazine, Industry experts (industry associations; Source: GWEC, Global Wind Report, 2025 report; Ministry of Heavy Industries, PM E-Drive Portal; CEA, National Electricity Plan Vol I; Company announcements; Industry experts; mec+ analysis; Dalberg analysis

The cleantech indigenisation pathways have been built on two demand scenarios – conservative and optimistic – to identify potential pathways and key enablers to achieve sectoral indigenisation targets (2/2)

Indigenisation Pathway Modelling Approach



Scenario criteria	CONSERVATIVE SCENARIO		OPTIMISTIC SCENARIO		
	E-mobility	Green Hydrogen	E-mobility	Green Hydrogen	Transmission
1 Government policy landscape	No additional subsidies on EVs beyond existing subsidies under PM E-DRIVE		Extension of subsidy schemes beyond 2026, especially for 2W, 3W, Bus and Trucks		
2 Adoption Trajectory	Limited TCO[1] and product innovation – overall penetration[2] across vehicle segments expected to reach ~32% by 2030	Fertilizer sector – corresponds to tendered green ammonia capacity Refinery sector – 5% to 15% green H_2 blending in 2027-2030 for refiners with >50KTPA H2 consumption	Charging infra scale up, product innovation and financing mechanisms could enable ~48% penetration by 2030	Fertilizer sector - 100% import substitution of ammonia from 2027 Refinery sector – 5% to 30% green H_2 blending in 2027-2030 for refiners with >50KTPA H2 consumption	*Demand for Transmission sector is **primarily government driven** and estimated to reach **6.5 lakh ckm by 2032***
3 Export growth		**EU, Japan, Singapore, South Korea, UK**: India could capture 10% of this market by 2030		**EU, Japan, Singapore, South Korea, UK**: India could capture 20% of this market	

(1) Total Cost of Ownership; (2) Penetration refers to % share of EVs in total annual vehicle sales; Sources: VAHAN Dashboard ; RMI, Niti Ayog, Harnessing Green Hydrogen, 2022; SECI, Clarification for setting up Production facilities for Green Hydrogen under SIGHT scheme, 2024; Bain, RMI, From Promise to Purchase: Unlocking India's Green Hydrogen Demand, 2025; MoP CEA, National Electricity Plan, Volume II – Transmission, 2024; Company announcements; Industry experts; Dalberg analysis

Incremental financing[1] is required across Demand, R&D, Raw Materials, Capex and Infra and Workforce levers to help improve indigenisation across cleantech manufacturing sectors

INR 60,300-67,400 Cr
In incentives to accelerate cleantech adoption

INR 10,000-15,500 Cr
To facilitate the development of an R&D ecosystem

INR 177,000-202,400 Cr
To secure access to raw materials and minerals

INR 323,400-540,600 Cr
To scale domestic cleantech manufacturing capacity

INR 19,300-31,600 Cr
To develop a skilled cleantech manufacturing workforce

(1) Refers to total incremental financing required across public and private sources; Source: Dalberg Analysis, Expert consultations

However, certain challenges persist in unlocking this incremental investment and scaling domestic cleantech manufacturing capacity

We explored four such key challenges that could limit scale-up of domestic cleantech capacity:

Low demand for indigenous cleantech

Limited offtake for domestically produced cleantech results in market risks (demand fluctuation, unsold inventory) for investors and manufacturers

A

Low cost – competitiveness and limited capacity

High raw material costs, fluctuating component supply and low scale of production for cleantech makes domestically produced cleantech 17-43% more expensive than imported cleantech

B

Unfavorable policies and taxes

Inverted tax and duty structures, coupled with misaligned input-output taxes and counter-effective duties further decreases cost competitiveness and could hinder indigenous cleantech development

C

Limited access to finance

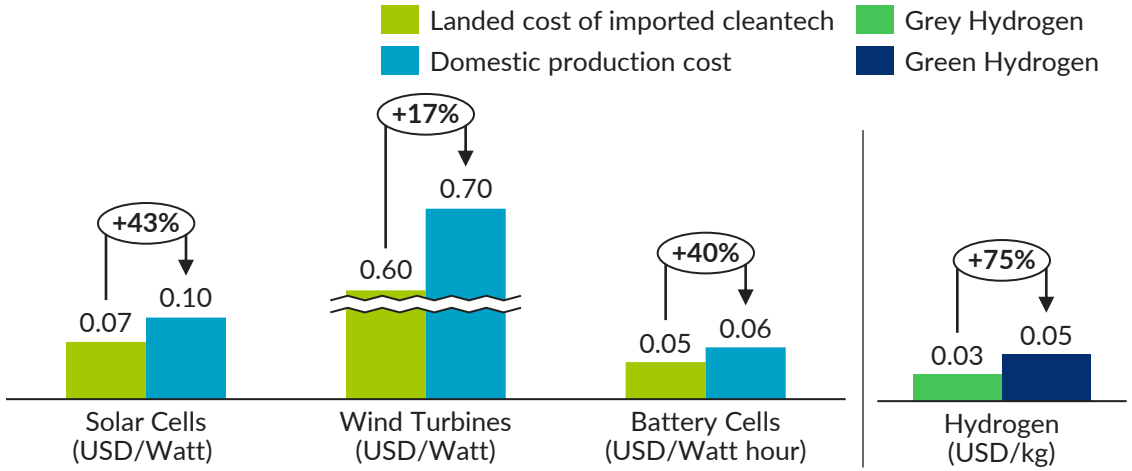
Small-scale players in the cleantech development and manufacturing ecosystem – startups and MSMEs, face high finance costs and limited access to formal credit, government support schemes

Detailed Ahead

A&B Beyond cleantech manufacturing capacity development, there is a need for additional financing support to drive cost competitiveness with imported cleantech, and overcome disadvantageous taxes and duties

A. Domestically manufactured cleantech is more expensive than imported/alternate tech, requiring additional support

Comparison of cost of domestic and imported cleantech/alternate tech production (USD/unit)



- Cost differential primarily driven by **import reliance** for **key inputs** – (Metallurgical Grade Silicon, Battery minerals, etc.) and **high electricity tariffs**
- Chinese **overcapacity** for **solar** and **battery cells** manufacturing resulted in **slashed prices** of imported cleantech – **aggravating the cost differential**
- **Support mechanisms** in **Fertilizer** and **Transport** sectors have shown success in **improving competitiveness** of **Green Hydrogen** as compared to **Grey**
- Similar support mechanisms are required across cleantech sectors to drive adoption of domestic cleantech products

INR 50,700-92,000 Cr

Total investment required to drive cost competitiveness in domestic cleantech

B. Inverted duty structures and unfavourable taxes and policies further risk hampering scale-up of indigenous cleantech capacity

Current duty and tax norms are anchored on easing cleantech assembly vs manufacturing – resulting in higher raw material costs

Inverted Customs and GST structures inflate raw material costs

- India's Customs tariff structure taxes raw materials, **intermediate goods** and **capital machinery** at rates **equal or higher** than those for **finished products**
- Current GST structure taxes **assembled renewable devices** at **5%** and key **inputs** face **~18% GST**

Additional duties and taxes dampen Basic Customs Duty (BCD) reductions

- Introduction of **additional duties** such as Agriculture and Infrastructure Development Cess (AIDC) in Solar industry, **dampen** the effects of **BCD reductions**

Additionally, effects of unaligned taxes and duties could cascade and hamper growth of domestic cleantech sector:

- **Differential input-output GST rates** and **output GST exemptions** on cleantech products could result in **Input Tax Credit Accumulation**, locking up working capital
- **Disproportionate Customs tariffs** on **Battery chemistries** could hinder progress in **Alternative Chemistry Cells** – BCD on LIB is ~5% (subject to IGCR), and 15% on Alternate chemistries
- **Anti-Dumping Duties** on import of **solar cells**, while beneficial in supporting indigenisation, could cause **cost volatility** for module manufacturers and extend the Solar module **demand-supply gap**

Source: Dalberg analysis, expert consultations

C Additionally, equitable access to finance is a challenge, particularly for EV manufacturers[1], with stakeholders at the centre of innovation facing high costs of private finance and limited access to benefits under public schemes

MSMEs[2] face challenges in accessing finance due to limited proven success of clean technologies

Financial and market access challenges

- **Lack of collateral and long-term credit records** further blocks **formal credit access** for newer/smaller MSMEs
- **Early-stage MSMEs** capture just **1% of investment value**, making it difficult to attract **PE/VC[3] funding** for growth phases

Cost and compliance pressures

- Transitioning to **cleantech component manufacturing** (especially in EVs) requires **heavy capital investment** in advanced R&D facilities and specialized machinery
- Complex compliance and credit access challenges generate **significant administrative costs**, consuming managerial bandwidth and slowing MSMEs' ability to **focus on growth and competitiveness**

Cleantech ecosystem weaknesses

- Cleantech ecosystem witnesses **underinvestment in innovation**, for example, only **2-3%** of total investment in **E-mobility** sector is **allocated to R&D**
- **Fragmented supply chains** and **limited coordination** among suppliers, financiers, and technology providers **reduce economies of scale** and slow modernization

Existing PLI[4] structures are anchored towards legacy players, limiting MSME access to government support

Common tools to extend government support for cleantech

- Production Linked Incentive schemes leverage **integrated DVA[5] targets** and **phased disbursement plans** to incentivize development of **domestic cleantech manufacturing**
- PLI schemes have been **successful in driving investments** in domestic cleantech – **~INR 115,000 Cr[6]** committed under **Solar PV Module** and **Automobile and Automotive Component PLIs**

PLI list currently anchored towards legacy players

- **High threshold requirements** limit startup and MSME eligibility
  - **Auto and Auto Components PLI[7]:** INR 10K Cr annual revenue for OEMs and INR 500 Cr for ACMs
  - **ACC[8] Battery Storage PLI:** Minimum investment of INR 225 Cr per GWh battery capacity
- Non-PLI status for such players results in **challenges in accessing finance and investments**, resulting in **~10-20% operational disadvantages** compared to PLI awardees
- This could further **stifle innovation** and limit **risk appetite** amidst startups, limiting innovation in the EV sector

(1) Including Auto component manufacturers; (2) Micro, Small and Medium Enterprises; (3) Private Equity/Venture Capital; (4) Production Linked Incentive; (5) Domestic Value addition; (6) As of June 2025; (7) Automobile and Automotive Components PLI; (8) Advanced Chemistry Cells; Source: Dalberg analysis, expert consultations

Unlocking requisite incremental funding, driving cost competitiveness and ensuring equitable access to finance requires strategic government investments (1/2)

Outcomes	Key Recommendations
Secured domestic cleantech offtake	• **Expand subsidy under SIGHT[1]** for **green ammonia** to cover entire 2030 projected fertilizer demand and absorb **cost differential** for **domestically manufactured electrolyzers** vs imported and secure demand for domestically manufactured electrolyzers • **Offer similar subsidy support** for **Steel** and **CGD[2]** sectors to drive competitive costs for public project export competitiveness of green steel

Manufacturing capacity development and cost competitiveness	• **Offer upfront capex subsidies** (15-25%) till 2030 for:
	  • Driving development of **incremental cleantech manufacturing capacity** across sectors
	  • Supporting **development of Battery mineral** and **Rare Earth Oxide Circularity** facilities
	  • Facilitating development of up to **50% capital equipment manufacturing facilities** for **EV sector**
	• **Provide 5 -10 % Production Linked Incentives** for manufacturing **HVDC[3] components** such as **DC capacitors**, **circuit breakers**, **reactors** etc.
	• **Offer upfront electricity price subsidies** of ~20% till 2030 to boost cost competitiveness of **domestic Battery manufacturing** facilities
	• **Allow for interest subvention** of (15-25%) till 2030 to **reduce finance costs** for domestic **Solar** and **Battery** manufacturing

(1) Strategic Interventions for Green Hydrogen Transmission; (2) City-Gas Distribution; (3) High Voltage Direct Current;
Source: Dalberg Analysis, Expert consultations

Unlocking requisite incremental funding, driving cost competitiveness and ensuring equitable access to finance requires strategic government investments (2/2)

Outcomes	Key Recommendations

Favorable policies and taxes supporting domestic cleantech	• **Rationalize Customs Duty structures:**
	  • Adopt a **calibrated duty and tariff rate quota** (**TRQ**) mechanism for **Solar Cell imports**, **temporarily** allowing duty-free or **concessional imports** up to defined annual quantity, linked to verified domestic production capacity, to **support module supply** in the short term
	  • Increase **BCD**[1] on **imported Battery cells** to ~**20%** across chemistries (LFP, Na-ion, etc.) till 2030, to **support domestic cell production**
	• **Provide import duty exemptions** till 2030 on **Solar** (Quartz crucibles, Graphite for hot zones) and **Battery** inputs (PVDF Binders, Electrolytes)
	• **Reduce GST rates for key inputs** across cleantech sectors and apply **zero-rated GST** on **outward supplies to government entities** to reduce Input Tax Credit Accumulation and maintain refund eligibility

Enhanced access to finance	• **Re-evaluate Auto PLI process and eligibility criteria** to make them friendly to **startups** and **MSMEs**
	• **Modify Advanced Chemistry Cells PLI support mechanisms** with **longer timelines** required to drive investment in incremental integrated capacity from Battery electrode to pack
	• **Design dedicated instruments to facilitate MSME access to finance across TRL bands,** e.g., the following can be leveraged for **EV ACMs**[2]:
	  • **TRL 1-3:** Dedicated innovation funds, Challenge based prizes, blending R&D grants with corporate CSR/VC catalytic capital
	  • **TRL 4-6:** Blended finance bridge funds (concessional debt/first-loss guarantee with private VC), OEM-backed co-financing pilot funds
	  • **TRL 7-9:** Interest subventions funds with concessional loan windows, Government backed transition funds with co-investment

(1) Basic Customs Duty; (2) Auto Component Manufacturers
Source: Dalberg Analysis, Expert consultations

SECTION TWO

ANNEX: SECTORAL FINANCING DEEP DIVES

SECTION TWO, SUB-SECTION A

SOLAR INDIGENISATION PATHWAYS

Financing | INR 0.80 to 1.54 Lakh Cr would be required during 2025-30 to achieve 50% cost-competitive indigenisation across the solar value chain, build a cohesive R&D ecosystem and train the required workforce

Government funding of INR 26,000-43,000 Cr would be required across demand acceleration, R&D, workforce skilling and subsidies on capex and interest by 2030 to achieve these goals

Theme	Total Funding Required (INR Cr)	Government Funding Required (INR Cr)	Key Activities	Potential outcomes
Demand & Market Architecture	700- 800	700- 800	EXIM Line of Credit[2] interest subvention for solar module export (Africa)	Boost solar modules export and reduce risks of dependency on the US as the main export market
R&D & Product Innovation	1,350-2,100	675-1,050	R&D infrastructure: INR 750-910 Cr for upgrades/ set up across 14-17 R&D labs; and R&D grant funding: INR 600-1,200 Cr	Prototyping to commercialization of high-potential 10-20 solar tech indigenously with industry-academia-government collaboration
Upstream Raw Materials & Critical Inputs	18,500-34,000	Detailed in cost competitiveness below	Capex for additional capacity to develop domestic polysilicon refining	Meet two-third of polysilicon demand for solar and semi-conductor sectors through domestic refining capacities
Capital Equipment & Infrastructure (A)	34,000-75,000[1]	Detailed in cost competitiveness below	Invest in capex expansion across the value chain; Support MSMEs to build select solar equipment domestically	Reduce import dependence for capital equipment where feasible; Ensure accelerated capacity expansion to meet 50% indigenisation
Talent & Workforce	5,000 -7,200	4,200-6,000	Training additional 60,300 low-skilled workers across solar value chain (polysilicon – module) and set up demo training facility at ITIs	Ensuring a stable supply of workers, reducing attrition and lowering training costs for manufacturers
Cost Competitive-ness (B)	20,000-35,000[3]	20,000 - 35,000[3]	Input subsidies on capex and interest subvention till 2030 and import duty exemption [4], GST rate reduction to 5% from 12% leading to potential tax revenue impact of INR 26,000-29,000 Cr	Increased cost competitiveness of domestic cells – potentially bringing within 5% of Chinese landed costs
TOTAL	80,000-154,000	26,000-43,000		

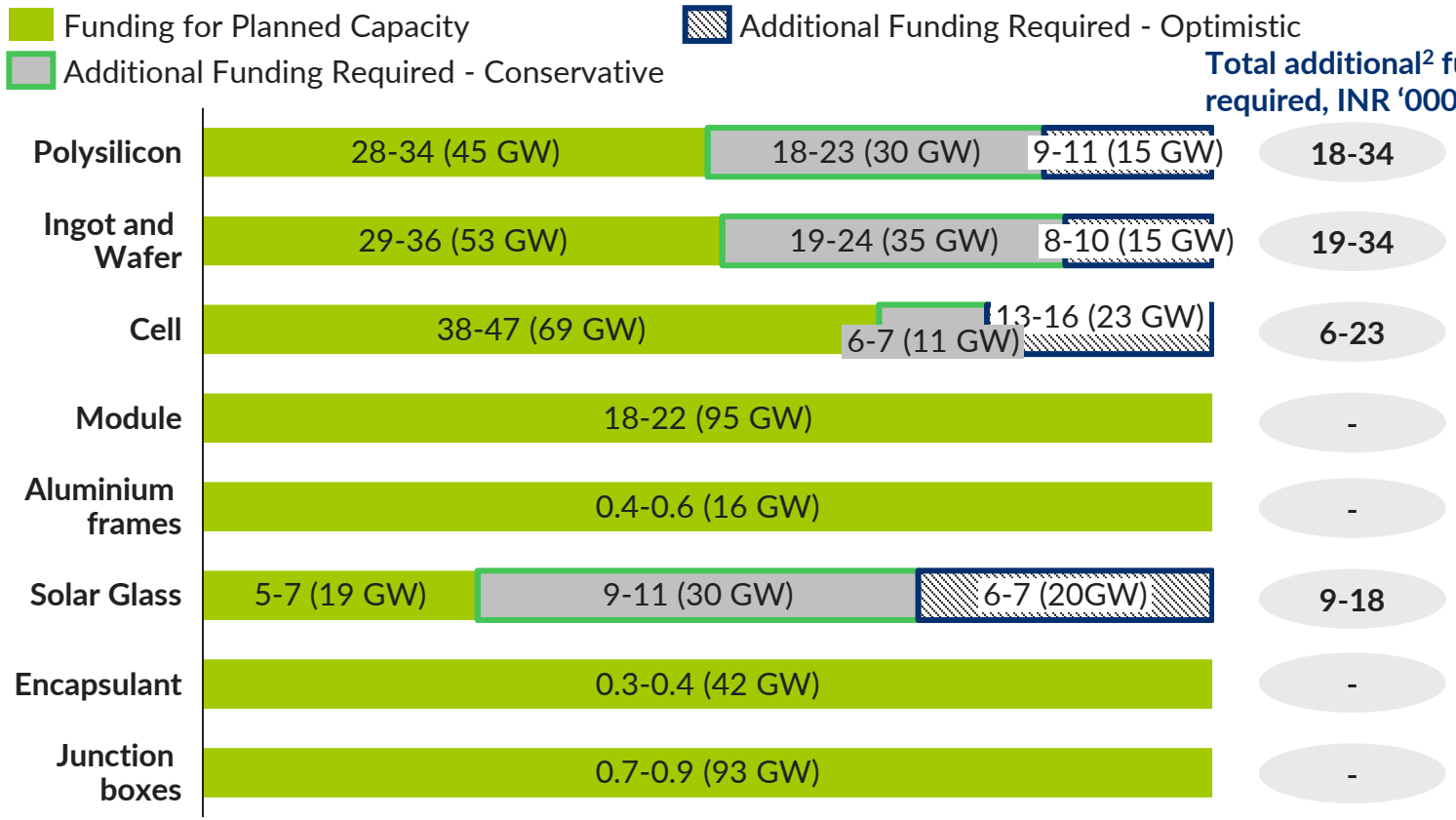
(X) *Detailed ahead*

(1) Does not include capex for polysilicon; (2) India announced USD 2 Bn support to solar projects in ISA member countries in 2018 - USD ~250 Mn has been allocated, USD 1.75 Bn remains unused; (3) Includes Input side capex subsidy and interest subvention till 2030; (4) On select raw materials – quartz crucible and graphite

A Capex Equipment & Infrastructure | Despite announced capacity additions, additional capital investment of up to INR 1.1 Lakh Cr required to achieve 50% indigenisation across Solar PV value chain (optimistic scenario)

Availability of subsidized financing and clear demand signals across the value chain are required to catalyze additional capital investment required to meet 50% 2030 indigenisation target

Cumulative capital investment required by 2030[1], INR '000 Cr (Capacity in GW)



Key initiatives required

- Non-fiscal demand driving incentives such as introducing progressively higher DVA requirements in ALMM
- Domestic market rate protection from global price fluctuations through BCD, with ADD as per global market conditions
- **Ancillaries:** Mix of BCD and DVA requirements under ALMM required for solar glass, encapsulants and aluminium frames

Incremental capex investment required, 2026-30

Conservative Scenario:
INR 52,500-64,500 Cr
Optimistic Scenario:
INR 89,000-109,000 Cr

(1) Chart excludes ancillaries such as Silicon sealant, Interconnects, Backsheets due to limited information available and lower contribution to value addition. Module capacity as per ALMM April 2025
(2) Assumed that planned capacities have already been funded
Source: MNRE, MEC+, RE Supply Chain Report 2024, Company announcements, Industry experts (industry associations, key manufacturing players), Dalberg Analysis

B Cost Competitiveness | INR 20,000-35,000 Cr of targeted capex subsidies and low-cost financing, could improve cost competitiveness for indigenous Indian solar cells to within 5% of Chinese cells landed costs today

Indigenisation of upstream components, subsidized capex and interest subvention could reduce domestic cell costs by 26% vs. current costs, ensuring no impact on LCOE and cost competitiveness with current landed costs for Chinese cells

Current landscape indicate strong need for cost competitiveness

- Global prices for solar modules reduced significantly due to geo-political shifts and over-capacity in China leading to a wider cost-gap of up to 75% for Indian modules (Latest Chinese modules cost: 8-8.5 Cents/Watt)
- Limited impact of existing State-level incentives on capex, interest subsidies for large manufacturers due to low ceilings

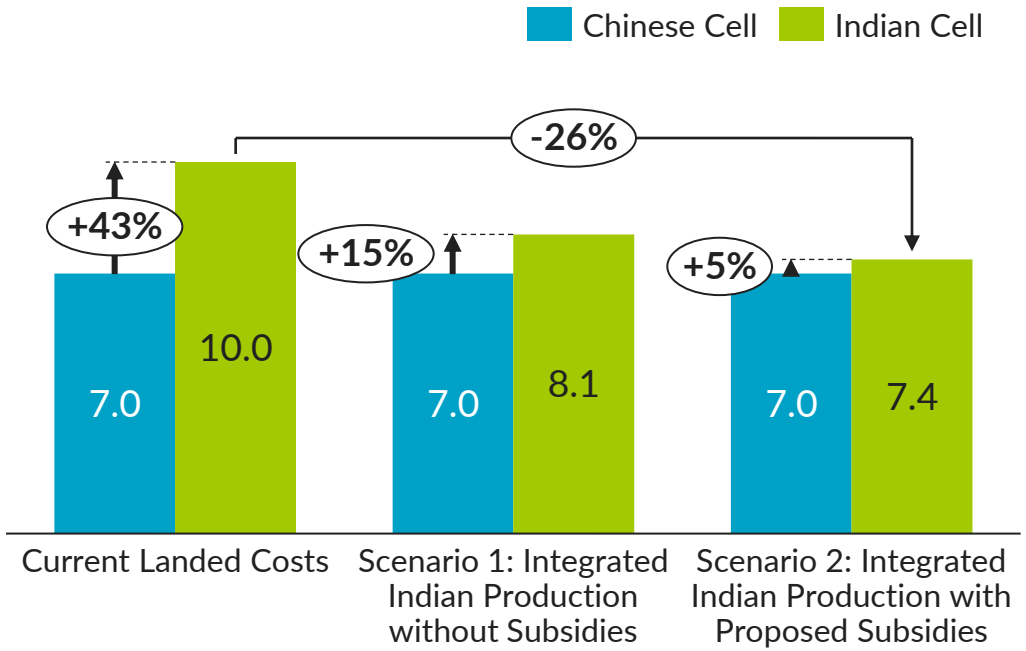
50% indigenisation could increase LCOE by 1-2% (3-5p/kWh), proposed subsidies could keep LCOE flat at current level:

- Upfront capex subsidy of 25% up to INR 10,000-22,000 Cr
- Interest subvention of 25% up to INR 9,500-13,000 Cr

Proposed interventions:

- Import duty exemption on quartz crucibles (23%) and graphite for graphite hotzones (7.5%) up to INR 3,500-4,500 Cr till 2030
- Reduce GST rate on modules from 12% to 5% - potential tax revenue impact of up to INR 22,000-25,000 Cr till 2030
- Improved EODB policies could also lower risk perception and improve attractiveness for financiers, potentially at better cost

Comparison of Chinese and Indian Cell Landed Cost[1], US cents/ Watt, ex-GST



Targeted subsidies on capex and interest subvention
INR 20,000-35,000 Cr till 2030

(1) Chinese solar cell landed cost is assumed to remain consistent through interventions like BCD, ALMM for cells etc. to ensure demand for domestic manufacturing

Source: MEC+, RE Supply Chain Report 2024, CSTEP, Feasibility Analysis for c-Si PV Manufacturing in India, Economic Times, Press Report, December 2024, Industry experts (industry associations, key manufacturing players), Dalberg Analysis

B Capex and financing costs, and key raw materials are key cost drivers targeted for subsidies and duty waivers along with restoring GST rate on modules to 5% from 12%

Category	Intervention type	Inputs and assumptions	Key recommendations	Total Impact, INR '000 Cr	
				Conservative Scenario	Optimistic Scenario
Input Subsidy	CAPEX Subsidy	• INR 53,000 – 109,000 Cr additional capex required • Cost contribution ranges from 1-15% across value chain	• 25% capex subsidy proposed • Covering incremental capacity required for Polysilicon, Ingot and Wafer, and Cell manufacturing	10,000-12,500	18,000-22,000
	Interest Rate Subsidy	• Interest rates assumed at 11% p.a. • Cost contribution ranges from 1-16% across value chain	• 25% interest subvention proposed • Effective rate of 8.25% p.a. • Proposed for announced and additional capacity required	~9,500	~13,000
Tax Revenue Impact	Import Duty Waiver on Quartz Crucibles and Graphite	• Contributes 15-20% of Ingot and Wafer cost • Import duty of 23% (Crucibles) and 7.5% (Graphite)	• BCD, CVD, ACD waiver proposed at 8-digit HS Code level • Covering all Ingot and Wafer manufacturing	~3,500	~4,500
	GST Reduction	• 12% GST on Modules currently	• Proposed GST reduction to 5% • Covering all module manufacturers	~22,000	~25,000

SECTION TWO, SUB-SECTION B

WIND INDIGENISATION PATHWAYS

INR 0.29 to 0.43 Lakh Cr would be required during 2025-30 to achieve 60% cost-competitive indigenisation across the wind value chain, build a cohesive R&D ecosystem and train the required workforce

Government funding of INR 10,000-12,400 Cr would be required across demand acceleration, R&D, workforce skilling and subsidies on capex and interest by 2030 to achieve these goals

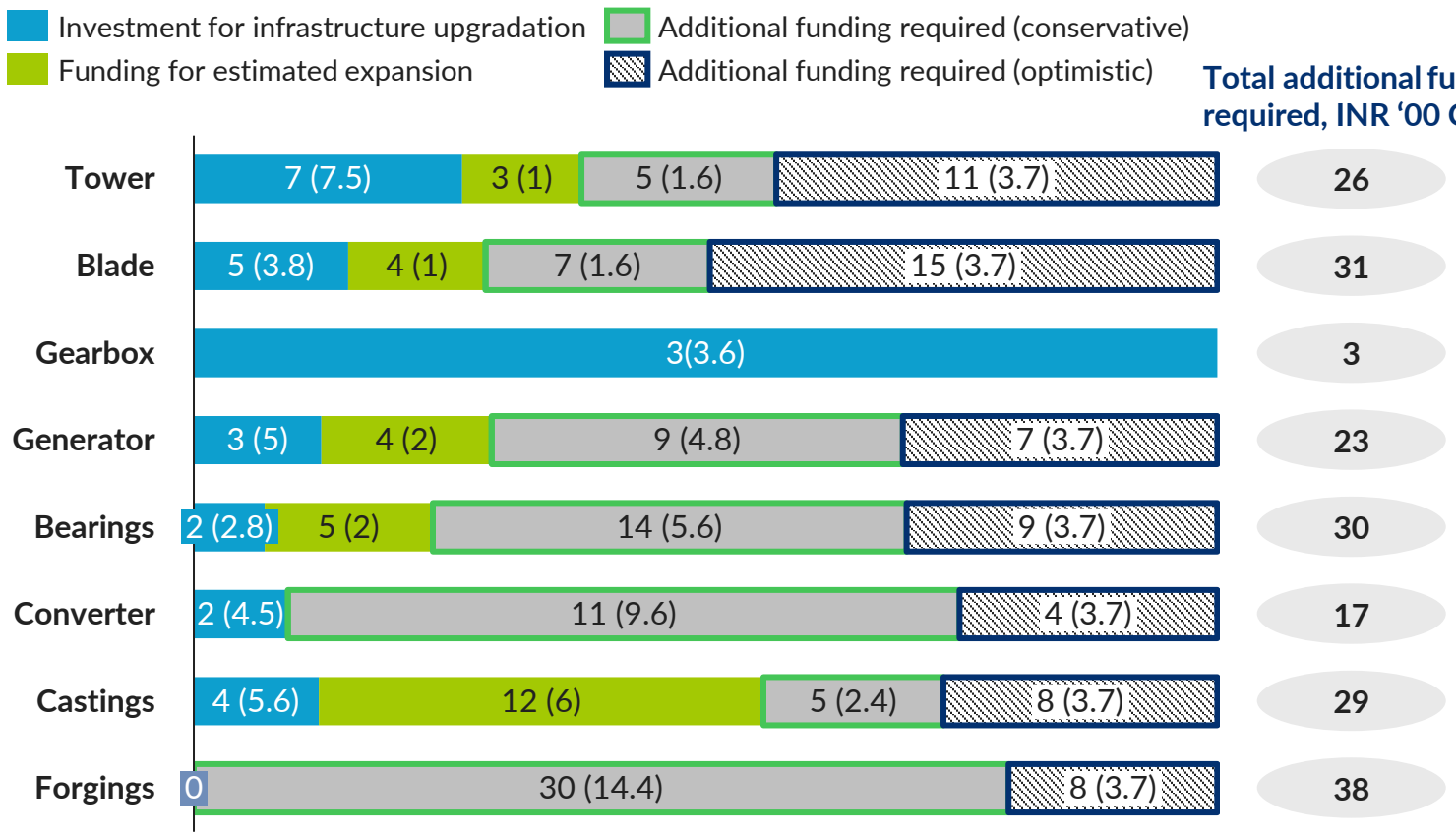
Theme	Total Funding Required (INR Cr)	Government Funding Required (INR Cr)	Key Activities	Potential outcomes
Demand & Market Architecture	350-400	350-400	EXIM Line of Credit[1] interest subvention for wind turbine export in (Africa)	Boost wind turbine export and reduce risks of dependency on the US and EU as the main export market
R&D & Product Innovation	450-500	450-500	R&D infrastructure: INR 450-500 Cr	Prototyping to commercialization of high-potential 10-20 wind innovation initiatives with industry-academia-government collaboration
Upstream Raw Materials & Critical Inputs	10,000-15,000	5,000	PLI to reduce the cost difference in raw materials, and investment in improving S355 steel manufacturing capability	Increase in local content of towers and gearbox contributing to ~18% of overall turbine DCR
Capital Equipment & Infrastructure (A)	13,500-20,700	Detailed in cost competitiveness below	Invest in capex expansion across the value chain; Support MSMEs to build select casting and forging domestically	Reduce import dependence for casting and forging capabilities where feasible; Ensure accelerated capacity expansion to meet 60% DCR
Talent & Workforce	2,580-3,100	2,580-3,100	Training additional 20,000 low-skilled workers across wind value chain and set up demo training facility at ITIs	Ensuring a stable supply of workers, reducing attrition and lowering training costs for manufacturers
Cost Competitive-ness (B)	1,700-3,400	1,700-3,400	Input subsidies on capex and interest subvention till 2030 and address inverted duty structure leading to potential tax revenue impact of INR 1,727-3,361 Cr	Increased cost competitiveness of domestic wind turbine– potentially bringing within 15% of Chinese landed costs
TOTAL	28,600-43,100	10,100-12,400		

(1) India announced USD 2 Bn support as LOC for renewable energy development to Africa ;

A Capital Equipment & Infrastructure | Despite announced capacity additions, additional capital investment of up to INR 26 Hundred Cr would be required to achieve 80% indigenisation across wind (optimistic scenario)

Availability of subsidized financing and clear demand signals across the value chain are required to catalyze additional capital investment required to meet 80% 2030 indigenisation target

Cumulative capital investment required by 2030, INR '00 Cr (Capacity in GW)



Key initiatives required

- **Incentives** to increase domestic supply of system level components such as large castings (hub), generators and for sub-system level manufacturing set up in the country
- **Aligned duty structures** to create domestic pricing competitiveness of sub-system level components, such as small castings, machined gears, forged rings, stator and rotor sub-assemblies, tower internals including flanges above 3m etc.

Incremental capex investment required, 2026-30

Conservative Scenario:
INR 13,500 – 14,500 Cr
Optimistic Scenario:
INR 19,700 – 20,700 Cr

Note: Assumed that planned capacities have already been funded; RoDTEP: Remission of Duties and Taxes on Exported Products; PLI: Production Linked Incentive
Source: mec+ analysis

B Cost Competitiveness | INR 1,700-3,400 Cr of targeted capex subsidies and low-cost financing, could improve cost competitiveness for Indian wind turbines at 60% LCR levels

Indigenisation of upstream components, subsidized capex and interest subvention could reduce domestic wind turbine costs by 10% vs. current costs, ensuring no impact on LCOE and cost competitiveness with current landed costs

Current landscape indicate strong need for cost competitiveness

- Current landed costs for Indian wind turbine components are up to 17% higher than Chinese turbine components, with this cost gap potentially widening to 25% if Indian production at 60% LCR (Local Content Ratio) operates without subsidies

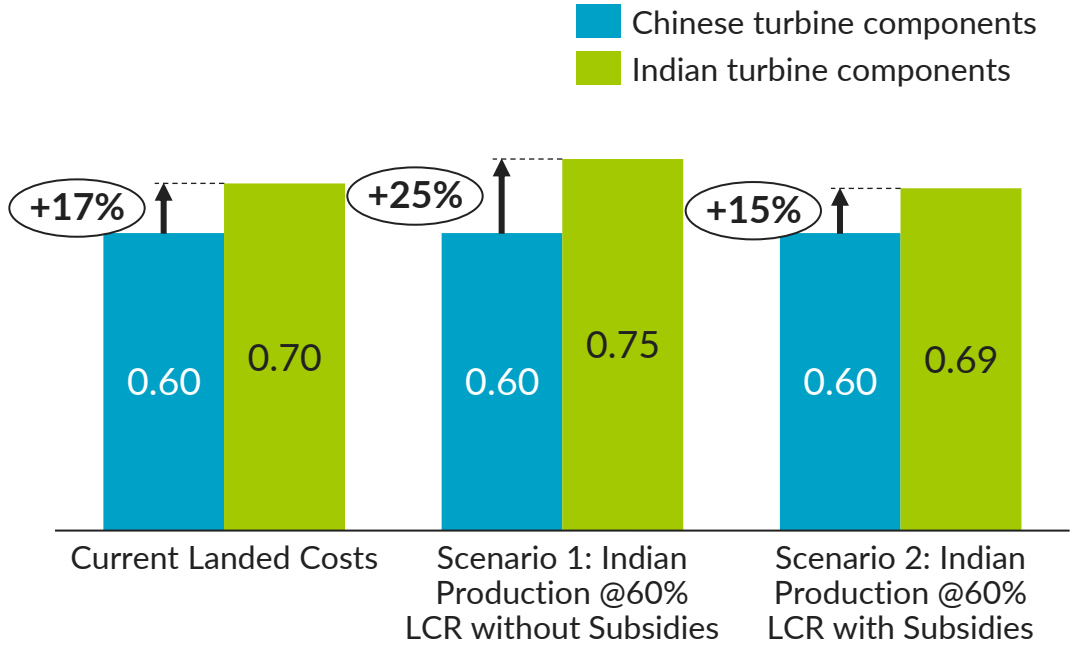
60% indigenisation could increase LCOE by 3-4% (6-8p/kWh), proposed subsidies could keep LCOE flat at current level:

- **Upfront capex subsidy** of **25%** up to **INR 1,225-2,700 Cr**
- **Interest subvention** of **23%** up to **INR 296-420 Cr**

Proposed interventions:

- **Reduce inverted duty effect:** Existing policy charges 7.5% and 10% on imports of parts and full generator /gearbox/tower respectively whereas import of con cast/ electrical grade steel attracts duties as high as 15% to 20%
- Proposed import duty waivers on key raw materials could have **potential tax revenue impact of INR 206-241 Cr**
- Improved EODB policies could also lower risk perception and improve attractiveness for financiers, potentially at better cost

Comparison of Chinese and Indian Turbine Cost[1], US dollars/ Watt, ex-GST



Targeted subsidies on capex and interest subvention
INR 1,700-3,400 Cr till 2030

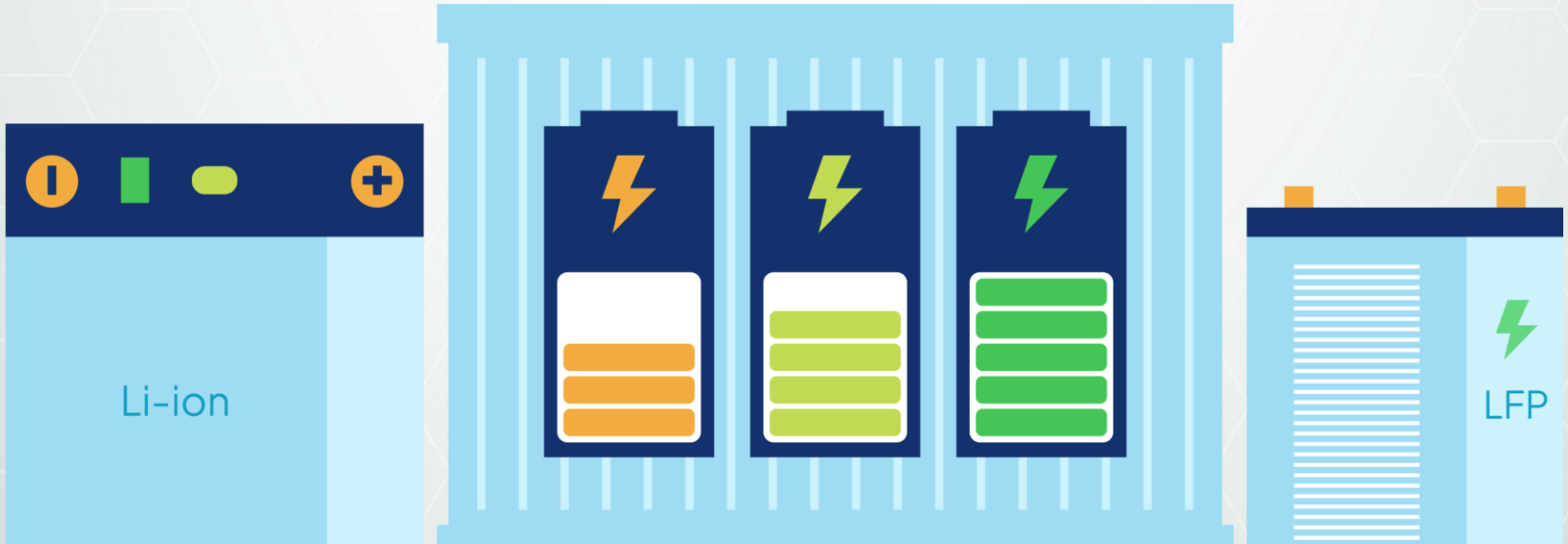
Source: MEC+, RE Supply Chain Report 2024, Industry experts (industry associations, key manufacturing players), Dalberg Analysis

B Capex and financing costs, and key raw materials are key cost drivers targeted for subsidies

Category	Intervention type	Inputs and assumptions	Key recommendations	Total Impact, INR Cr	
				Conservative Scenario	Optimistic Scenario
Input Subsidy	CAPEX Subsidy	• INR 13,500-21,000 additional capex required • Out of which, INR 4,900 - 11,000 Cr is required for casting, forging and bearing	• 25% capex subsidy proposed • Covering incremental capacity required for casting, forging and bearings	~1,225	~2,700
	Interest Rate Subsidy	• Interest rates assumed at 11% p.a.	• 23% interest subvention proposed • Effective rate of 8.5% p.a. • Proposed for upgrades, announced and additional capacity required	~296	~420

SECTION TWO, SUB-SECTION C

BATTERY INDIGENISATION PATHWAYS



Financing | INR 2.6-3.7 Lakh Cr would be required during 2025-30 to achieve 45% cost-competitive indigenisation across the battery value chain, build a cohesive R&D ecosystem and train the required workforce

Government funding of INR 64.8-92.2 Lakh Cr would be required across demand acceleration, R&D, workforce skilling and subsidies on electricity, capex and interest by 2030 to achieve these goals

Theme	Total Funding Required (INR Cr)	Government Funding Required (INR Cr)	Key Activities	Potential outcomes
Demand & Market Architecture	4,500-6,500	4,500-6,500	Introduction of Approved List of Pack and Cell Manufacturers, DVA requirements for EV and BESS supported by VGF for domestic e4W	Increased demand for domestically produced battery cells
R&D & Product Innovation	1,800-3,600	900-1,800	12-16 R&D development and testing labs for battery technology, battery recycling R&D; INR 600-1,200 funding for project grants	Indigenous development of battery technologies; accelerated adoption of early-stage innovative global technologies
Upstream Raw Materials & Critical Inputs	143,000-146,600[1]	29,400-30,400	Input subsidies on capex for refining, refurbishment and recycling capacity; investment in collection facilities and mineral storage facility	Reduce import dependency on refined raw materials; meet mineral demand through recycled materials and use 21 GWh refurbished batteries
Capital Equipment & Infrastructure (A)	76,000-158,000[2]	Detailed in cost competitiveness below	Support timely deployment of announced capacities through incentives; Indigenous production of up to 55% of capital equipment	Reduce import dependence for capital equipment where feasible; Ensure accelerated capacity expansion to meet 45% indigenisation target
Talent & Workforce	4,000-7,500	3,000-5,500	Training additional 58,000-91,000 ultra, high, and low skilled workers across the value chain and setting up demo training and R&D facilities	Ensuring a stable supply of workers, reducing attrition and lowering training costs for manufacturers
Cost Competitive-ness (B)	27,000-48,000[3]	27,000 – 48,000[3]	Input subsidies on electricity, capex and interest subvention till 2030; import duty exemption[4] and increased BCD on imported cells leading to INR 800-3000 Cr potential net tax revenue increase	Increased cost competitiveness of domestic battery cells – potentially bringing within 23% of Chinese landed costs
TOTAL	256,200-370,200	64,800-92,200		

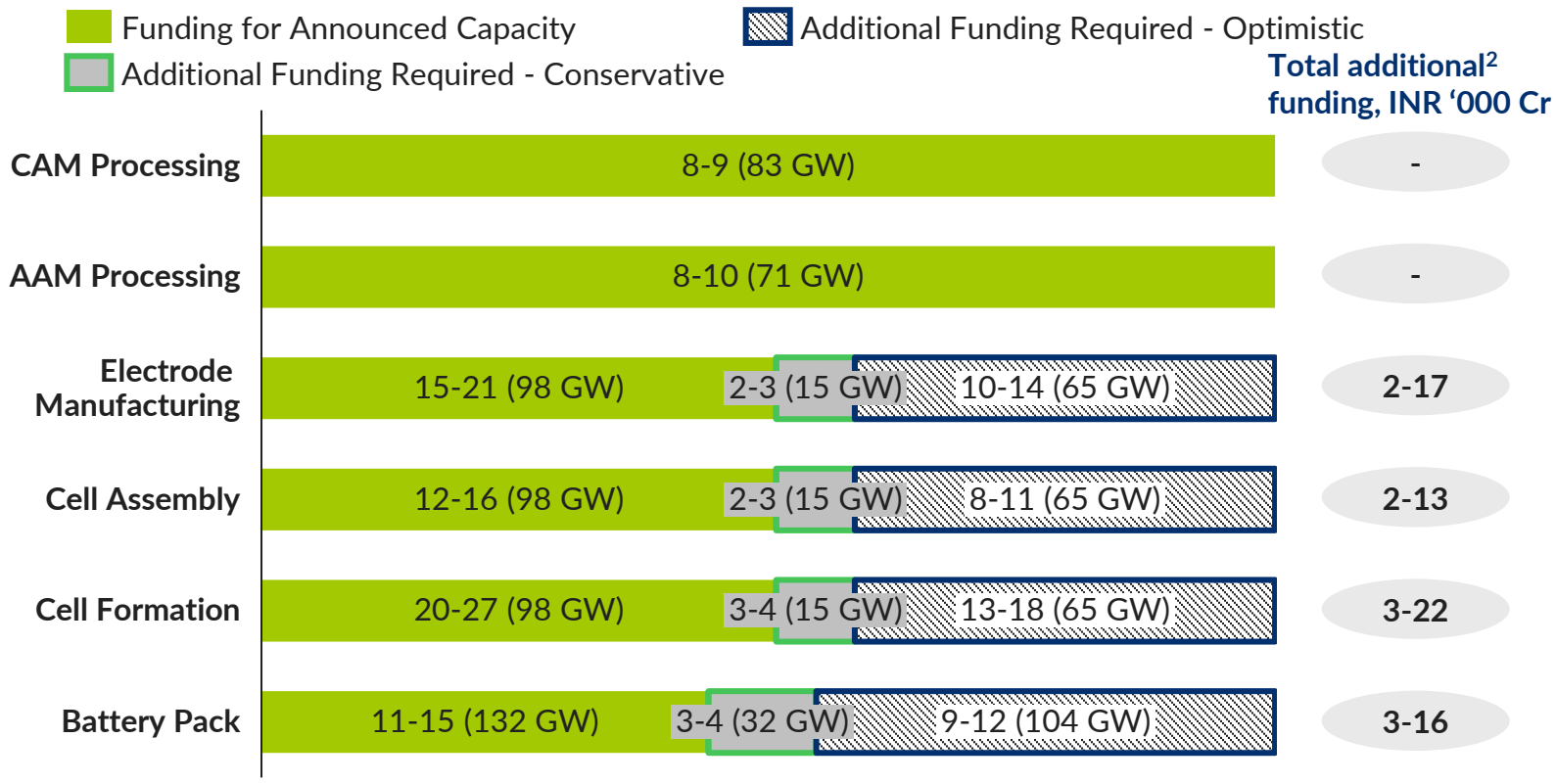
(X) *Detailed ahead*

(1) Refers to investments required for domestic refining, circularity and stockpiling (2) Capex for CAM, AAM, Cell and Pack Manufacturing for announced and additional capacities required (3) Includes Input side electricity, capex subsidy and interest subvention till 2030; (4) On select raw materials – PVDF Binder and Electrolytes

A Capital Equipment & Infrastructure | Beyond announced capacity additions of INR 90,000 Cr, additional capital investment of up to INR 68,000 Cr would be required to achieve 45% indigenisation across battery value chain

Critical to ensure that announced capacities are set up within timelines, including key upstream areas like Cathode and Anode active material production

Cumulative capital investment required till 2030[1], INR '000 Cr (Capacity in GWh)



Key insights

- Several capacity additions due in 2024, 2025 **delayed potentially due to current global market dynamics**
- Need to address potential **risk of announced capacities facing similar delays** (capital investment of INR 90,000 Cr)
- Policy support like **modified PLI with longer timelines** required to drive investment in incremental integrated capacity from electrode to pack
- Incentives for **Cathode, Anode Active material production** required to secure supply chains

Incremental capex investment required (beyond announced capacity), 2026-30

Conservative Scenario:
INR 10,000-14,000 Cr
Optimistic Scenario:
INR 49,000-68,000 Cr

(1) CAM and AAM refer to Cathode Active Material and Anode Active Material respectively
(2) Assumed that announced capacities have already been funded and that cell capacity announcements refer to 'cell to pack' manufacturing
(3) Assumed 2-3-year delay in commissioning of announced capacities across value chain due to global market conditions
Source: Company announcements, Industry experts (industry associations, key manufacturing players), Dalberg Analysis

B Cost Competitiveness | INR 27,000-48,000 Cr of targeted electricity, capex subsidies, and low-cost financing could narrow cost competitiveness gap for indigenous battery cells to 13% of potential Chinese landed cost

Mix of input subsidies, import duty waivers, tariff barriers and establishing global partnerships on technology and raw material sourcing could lead to long term cost-competitiveness for domestic manufacturers

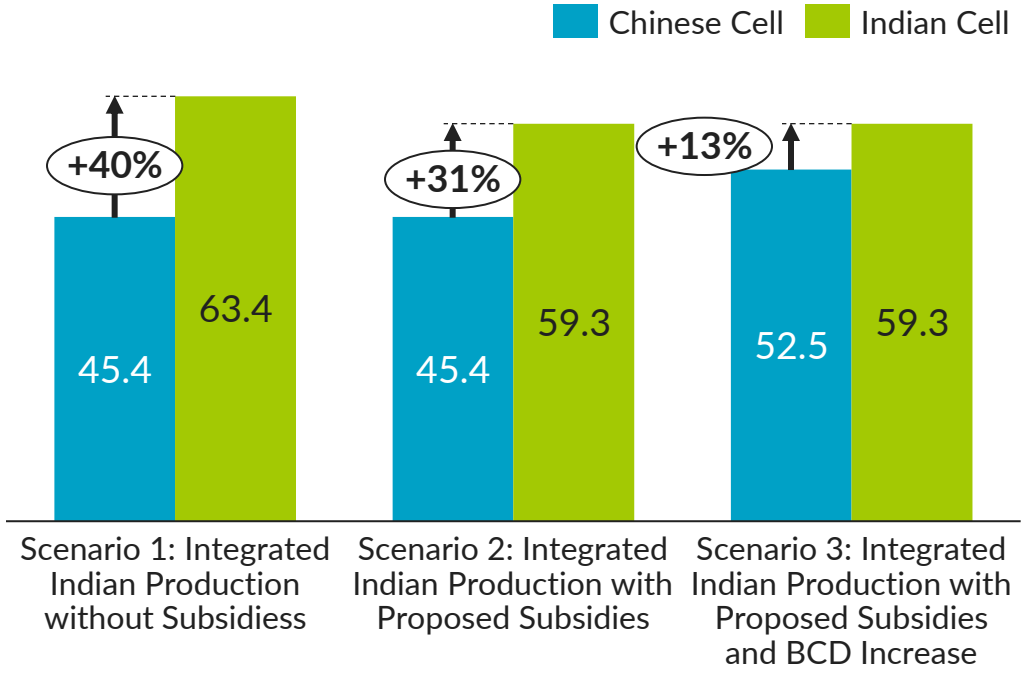
Current landscape indicates major challenges to cost competitiveness

- **Potential 40% cost–gap** between landed costs for Chinese LFP cells[1] and Indian cells from large scale integrated manufacturing facilities[3] potentially due to Chinese over capacity
- **Cost-competitiveness unlikely in short term** – need for tariff (e.g. raising BCD on cell imports) and non-tariff barriers (e.g. ALMM, DVA mandates)
- Limited impact of existing **State-level incentives** on capex, interest subsidies for large manufacturers due to **low ceilings**

Proposed interventions could limit potential LCOE impact of 45% battery indigenisation to 7-10%[4]:

Intervention type	Impact (INR Cr)
Electricity price subsidy of **20%** till 2030	**10,500-16,500**
Upfront capex subsidy of **15%**	**12,500-25,000**
Interest subvention of **15%** till 2030	**4000-6500**
Import duty exemption on key raw materials[5] till 2030	**1500-3000**
Increased BCD to **20%** on imported cells till 2030	**1000-3500**

Comparison of Chinese and Indian Battery Cell Landed Cost[1,2], USD kWh, ex-GST



Targeted subsidies on electricity, capex and interest subvention
INR 27,000-48,000 Cr till 2030

Detailed on next slide

(1) Landed costs for Cells for stationary applications potentially 5-7% lower, average cell price assumed; (2) Chinese cell landed cost assumed to remain consistent via interventions like BCD; (3) Cost estimates assume optimized integrated production at multi-GWh scale, costs for smaller plants could be 20-25% higher; (4) Refers to Solar LCOE; (5) On PVDF and Electrolytes; (6) Potential additional revenue
Source: Shanghai Metal Market, Industry experts (industry associations, key manufacturing players), Dalberg Analysis

B Electricity, capex and financing costs, and key raw materials are key cost drivers targeted for subsidies and duty waivers to narrow the cost competitive gap with Chinese imports

Category	Intervention type	Inputs and assumptions	Key recommendations	Total Impact, INR '000 Cr	
				Conservative	Optimistic
Input Subsidy	Electricity Price Subsidy	• Average electricity price of INR 9/Unit • Cost contribution of 16% of overall value chain	• 20% price subsidy proposed • Effective electricity price INR 7.2/Unit • Covering entire value chain	10,500	16,500
	CAPEX Subsidy	• INR 76,000 – 158,000 Cr additional capex required[1] • 5-7% cost contribution of overall value chain	• 15% capex subsidy proposed • Covering announced and incremental capacity required across manufacturing value chain	12,500-17,000	18,000-25,000
	Interest Rate Subsidy	• Interest rate assumed 11% • 7-9% cost contribution of overall value chain	• 15% interest subvention proposed • Effective rate of 9.35% p.a. • Proposed for announced and additional capacity required	4,000	6.500
Tax Revenue Impact	Import Duty Waiver on PVDF Binder and Electrolytes	• ~10% of raw material cost for electrode, cell assembly • Current BCD 11% (PVDF) and 7.5% (Electrolytes)	• BCD, CVD, ACD waiver proposed at 8-digit HS Code level • Covering Electrode and Cell Assembly stages	1,500	3,000
	Import Duty Increase on Battery Cells	• Current BCD has provision for reduction to 5% if for E-mobility, BESS	• Restoring 20% BCD • Will result in potential revenue increase	2,500	5,500

(1) Additional Capex refers to both announced and incremental capex
Source: Department of Revenue Notification; Industry experts (industry associations, key manufacturing players), Dalberg Analysis

SECTION TWO, SUB-SECTION D

E-MOBILITY INDIGENISATION PATHWAYS

INR 228.6-302.6 K Cr would be required during 2025-30 to achieve 50% indigenisation across the EV value chain, build a cohesive R&D ecosystem and train the required workforce

Government funding of INR 71.4-75.4K Cr would be required across demand acceleration, R&D, workforce skilling and subsidies on electricity, capex and interest by 2030 to achieve these goals

Theme	Total Funding Required (INR Cr)	Government Funding Required (INR Cr)	Key Activities	Potential outcomes
Demand & Market Architecture[1]	45,500-46,200	40,600-41,200	Subsidies for E4Ws, E-buses and E-trucks segment to drive further adoption and improving the business case of charging stations for CPOs	Additional 5 Mn E4Ws, 65,000 E-buses, 27,000 E-trucks and 8.7 lakh charging points by 2030
R&D & Product Innovation	5,000-7,700	2,250-3,450	4-6 R&D development and 2 testing labs for EV Component level R&D; INR 1,000-1,200 funding for project grants	Indigenous development of EV Component technologies; accelerated adoption of early-stage innovative global technologies
Upstream Raw Materials & Critical Inputs	5,200-6,200	900-1,100	Input subsidies on capex for domestic Rare Earth Oxide production capacity; investment in magnet recycling facilities to support circularity	Reduce import dependency on refined Rare Earth Oxides; meet Oxide demand through recycled Permanent magnets
Capital Equipment & Infrastructure	165,600-230,000	~24,600	A Indigenous production of up to 50% equipment for Power electronics, Motors, BMS and EVSEs[2];	Reduce import dependence for equipment where feasible; drive accelerated EV capacity expansion
			B Capex & interest support across component & charger manufacturing, & vehicle assembly	Improved manufacturing capacity and efficiency, potentially leading to higher localisation for EVs
			C Structural modifications to Auto PLI[3]	Enabling greater access to, and utilization of PLI
Talent & Workforce	7,300-12,900	3,000-5,000	Training additional 6 Lakh ultra, high, and low skilled workers across the EV value chain and setting up demo training and R&D facilities	Ensuring a stable supply of workers, reducing attrition and lowering training costs for manufacturers
TOTAL	228,600-302,600	71,400-75,400		

X *Detailed ahead*

(1) Includes ~INR 31,700 Cr available undisbursed funds under PM E-DRIVE and PM E-bus Sewa to drive EV adoption across vehicle segments; (2) Investment estimations for this intervention have been covered in the Financing section; (3) Auto and Auto Components PLI

Capital Equipment & Infrastructure | Enabling greater EV penetration & localisation requires both financial support to scale Component and Equipment manufacturing capacity, as well as effective support disbursement measures

Three key questions were explored withing Financing for capex and infrastructure:

A 

What is the capex investment needed to scale local capital equipment manufacturing?

B 

What is the total capex and working capital needed to scale local EV component manufacturing ecosystem?

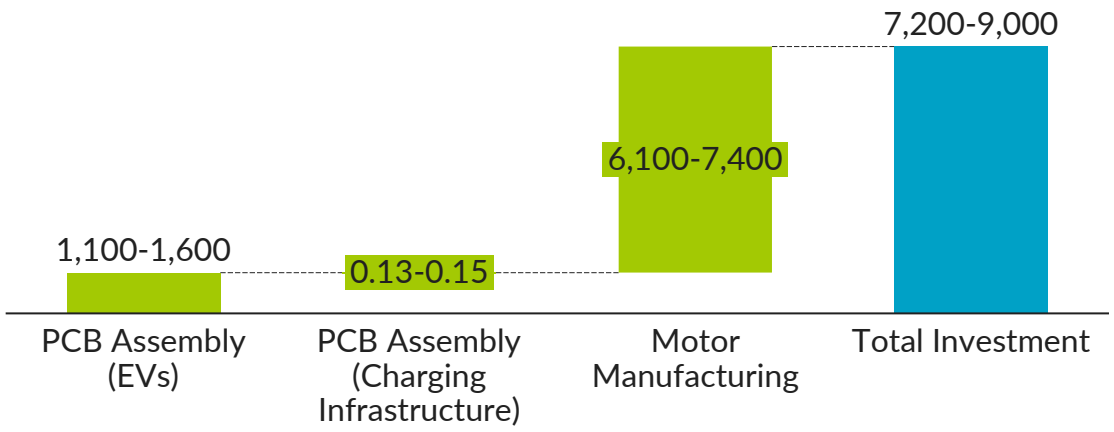
C 

How can existing financing support mechanisms (commonly PLIs) be made more effective in supporting local EV component manufacturing?

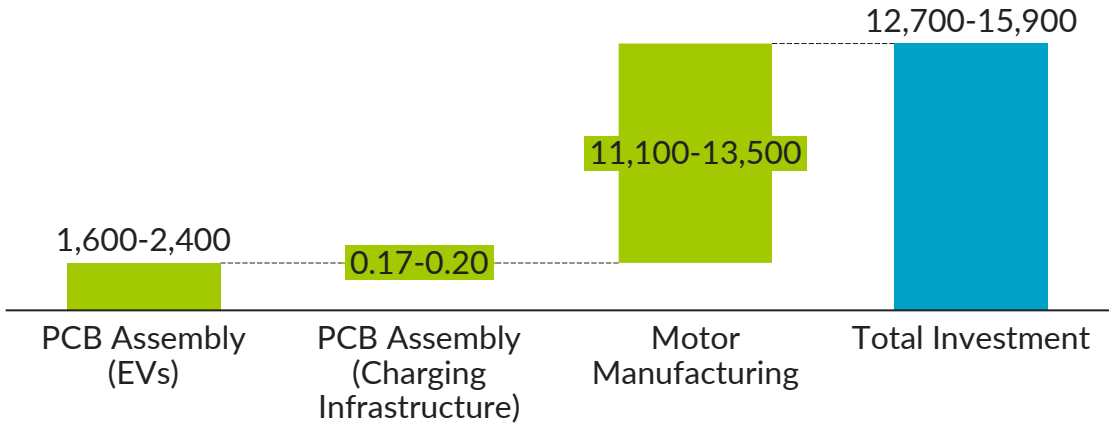
A **Capital Equipment & Infrastructure** | Development of local capital equipment manufacturing facilities requires additional Capex subsidies of INR 1,800-2,250 Cr in Conservative and INR 3,175-3,975 Cr in Optimistic scenario

Cumulative investment required to develop capital equipment capacity to support 50% localisation across EV ecosystem, INR Cr[1]

Conservative Scenario[2]



Optimistic Scenario[2]



Key Insights:

- Scaling capital equipment availability for **PCB Assembly** can **unlock localisation across multiple sectors** – building the **foundation for** backward integration into **PCB manufacturing**
- Some players already claim **60-70% localisation** on **charging infrastructure**, and **PCB Assembly** for **EVSE's** could further improve localisation

Key machines to indigenise[3]:

- **PCB Assembly:** Reflow Oven, Loading and Unloading, Solder Paste Printing and Wave Soldering Machines
- **Motor Manufacturing:** Rotor Magnet Insertion and Rotor Balancing Machines

Total investment required:	Subsidy required @ 25%[4]:
Conservative Scenario: **INR 8,100-10,100 Cr**	Conservative Scenario: **INR 1,800-2,250 Cr**
Optimistic Scenario: **INR 14,200-17,800 Cr**	Optimistic Scenario: **INR 3,175-3,975 Cr**

(1) Investment limited to capital equipment for EV sector; (2) Scenarios in line with the scenarios used to forecast annual EV registrations – detailed in Demand Acceleration section; (3) Machines with synergies with other industries are considered. Investment for PCB Assembly excludes Pick and Place, and Automated Optical Inspection machines, and Investment for Motor Manufacturing excludes CNC Machines and Coil Winding Machines; (4) Similar subsidies of 25% exist under Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS) for power electronics and PCBs. This recommendation aims to ensure these benefits cascade to the EV sector.

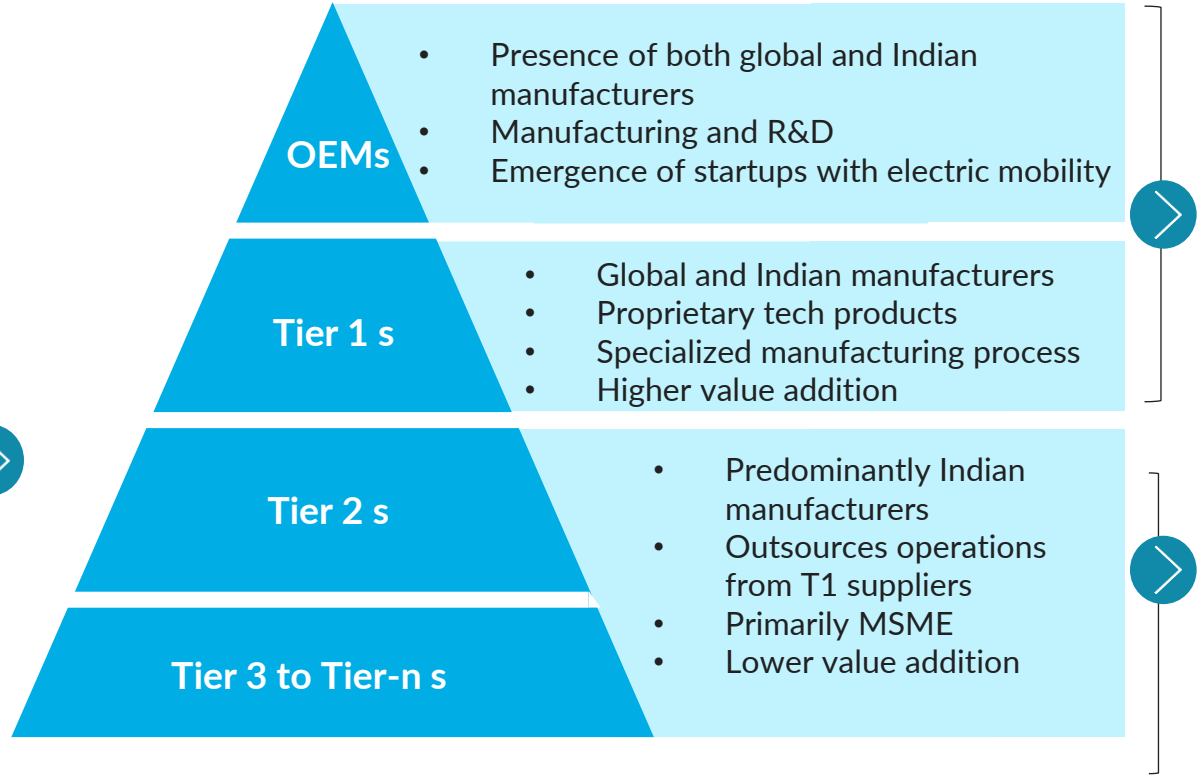
B Capital Equipment & Infrastructure | Financing EV manufacturing ecosystem is expected to require ~INR 156.7-213.8K crore till 2030 across OEMs and auto component manufacturers, partially covering interest costs

INR 124-164K Cr capex investment and INR 12-18K Cr government support required for EV ecosystem by 2030

	Investment required *(INR crore)*	Subsidy Support[1] *(INR crore)*
Component manufacturing		
BMS & other systems	~5.6K	~0.5K
Motors	~9K	~0.8K
Power electronics	~11.2K	~1K
Working capital needs	~18K	-
OEM–led Vehicle assembly	26-63.7K	2.3-5.7K
Charging infrastructure manufacturing[2]	40.6-52.2K	0.7K
Other ecosystem investments[3]	3.7-13.6	
TOTAL	124-163.5K	~12.4-18.2K

Additionally, government led concessional finance of **INR 5.8-9 K Cr** can be provided to support EV ecosystem manufacturers cover interest costs of **INR 29.2-44.9K Cr**[3]

Financing requirements for component manufacturing will vary significantly between OEMs and auto-component manufacturers



The expected component manufacturing capex investment is expected to increase to **INR 55K crores** by 2035, of which **INR 14K crores** will be needed for the MSME segment

(1) Capex subsidies calculated at a 20% rate, similar to existing government schemes; (2) Subsidy support for charging infrastructure estimated is above and beyond INR 4,000 Cr specified as a demand intervention, and is required only in optimistic scenario; (3) Available budget under the Auto and Auto Component PLI that is expected to be required in the ecosystem; (4) Interest costs assume 11% interest rate, 70% Debt component and a 7 year loan tenure for capex financing. 20% of these costs are expected to be met via the government led concessional debt; Source: CPI, Roadmap for an Automotive Component Technology Upgradation Facility, 2025

B **Capital Equipment & Infrastructure** | However, MSMEs face heightened challenges when compared to OEMs & Tier 1 s, especially for financing, compliance pressures and in terms of the institutional structures

While the financing needs for Large OEMs and T1 s are large, they can tap into greater sources of finance owing to stronger balance sheets, targeted PLI schemes etc. however, MSMEs face greater critical challenges including -

1 Financial & Market Access Challenges

- **Restricted access to formal credit:** Banks demand consistent profitability, and clean credit records. Lack of collateral further blocks credit access for newer/smaller MSMEs
- **Bias in equity investment:** PE/VC models favor scalable, late-stage, high-growth companies. Early-stage MSMEs capture just 1% of investment value, making it difficult to raise funds at critical growth phases.

2 Cost & Compliance Pressures

- **Prohibitive capital costs for modernization:** Transitioning to EV components requires heavy investment in advanced R&D facilities and specialized machinery, much of which must be imported
- **High overheads limit efficiency:** Complex compliance and credit access challenges generate significant administrative costs. These overheads consume scarce managerial bandwidth and slow MSMEs' ability to focus on growth and competitiveness.

3 Ecosystem Weaknesses

- **Underinvestment in innovation**: Only 22% of total investment (USD 162 million) is allocated to R&D and NPD. Capital flows are directed toward scaling operations rather than supporting innovation.
- **Weak ecosystem integration:** Fragmented supply chains and limited coordination among suppliers, financiers, and technology providers reduce economies of scale and slow modernization.

B **Capital Equipment & Infrastructure** | Ensuring financing availability for MSMEs across EV tech development lifecycle will be critical especially with acute capital shortages during prototype and early commercialization

TRL Band	Typical Funding Now Available	Core Financing Gaps / Barriers	% of total investment needed
TRL 1–3 Idea to lab proof	• DST, CSIR, academic grants • Startup India Seed Fund • NIDHI-PRAYAS micro-grants- • Founder capital	• Non-academic founders struggle to access public R&D pools • Almost no angel/VC appetite for pre-prototype hardware • Grants (₹10–20 lakh) cover only a fraction of lab & test-rig costs	**~15%** Small capital per project but many ideas. High technical risk; relies on grants/seed funding
TRL 4–6 Prototype to pilot in a relevant environment	• DST EVolutionS grants (up to ₹50 lakh) • Technology Development Board's soft loans • Limited angel / climate-tech seed funds	• Prototyping, tooling & certification need ₹1–5 crore • Public support capped, equity investors still see high-tech market risk • Bank credit unavailable without collateral or revenues	**~35%** Costs jump ~10× vs. lab stage; Government/targeted funds crucial to de-risk this stage
TRL 7–9 Pilot plant to commercial scale	• Series A/B venture equity & venture debt- Bank/SIDBI loans; credit-guarantee schemes (CGTMSE, CGSS) • Central/state capex subsidies; Auto & ACC-Battery PLIs	• Capex of ₹50–200 crore exceeds most MSME balance sheets • PLI eligibility (₹500 crore revenue / ₹150 crore assets) sidelines MSMEs • Working-capital crunch as OEM payment cycles stretch • Banks remain risk-averse despite guarantees	**~50%** Dominates funding needs due to heavy capex. Lower tech risk but still financing hurdles (banks reluctant without de-risking). Largest share ensures MSMEs can build production capacity by 2030.

Chronically underserved

Source: CPI, Roadmap for an Automotive Component Technology Upgradation Facility, 2025

B **Capital Equipment & Infrastructure** | A mix of funding instruments will be necessary for MSMEs to meet 50% localisation targets and maintain their current 25% share in industry's turnover

TRL Band	Recommended instruments & interventions
TRL 1–3 Idea to lab proof	• **Dedicated innovation fund:** A pooled pre-seed EV innovation fund blending public R&D grants with corporate CSR/VC catalytic capital • **Challenge-based innovation prizes:** Modeled on global ARPA-E/EIC calls, prize-based competitions for EV MSME innovations in motor design, battery packaging, and electronics. Similar to China's **"Little Giants"** program which certifies high-tech SMEs for preferential loans, subsidies, and research partnerships – demonstrating how early-stage public support plus recognition can unlock MSME innovation.
TRL 4–6 Prototype to pilot in a relevant environment	• **Blended-finance bridge funds:** Structures that pair concessional debt or first-loss guarantees with private VC. • **Extended EvolutionS-type programs:** Larger ticket sizes (₹2–5 crore vs. ₹50 lakh) through state incubators, tied to performance milestones • **OEM-backed pilot funds:** Co-financing pools where OEMs and Tier-1s share pilot risk with MSMEs, ensuring order visibility • **Enhance utilization of equity fund from SIDBI:** Simplify access and broaden eligibility for MSMEs while building readiness programs for equity investments to ensure fuller fund utilization
TRL 7–9 Pilot plant to commercial scale	• **MSME-tier PLI:** Lower eligibility thresholds (e.g., ₹50 crore revenue instead of ₹500 crore) and milestone-based disbursal • **Interest subvention funds:** Dedicated concessional loan window reducing MSME borrowing costs from ~12–14% down to 7–8% • **Transition funds with co-investment:** Government-backed cornerstone investors catalyzing family offices/DFIs into MSME tech-upgrade funds

Source: CPI, Roadmap for an Automotive Component Technology Upgradation Facility, 2025

C **Capital Equipment & Infrastructure** | Automobile and Auto Component PLI (critical public support mechanism), witnessed some success, but also faces critical challenges limiting efficient fund disbursal and utilization

The Automobile and Auto-Component PLI has been a valuable tool in boosting domestic EV manufacturing…

115 & 82
applications received and shortlisted respectively across OEMs and s

18 & 4
OEMs received approval for individual products and received incentive payouts respectively

INR 25K Cr
committed as investments under the scheme till December 2024

INR 322 Cr
disbursed as incentives till March 2025

…however, the EV ecosystem faces some challenges in effective fund disbursal under such PLI schemes

PLI list currently anchored towards legacy players:

- **High threshold requirements** (INR 10K Cr annual revenue for OEMs and INR 500 Cr for s) limit startup and MSME participation
- Non-PLI status for such players results in **challenges in accessing finance and investments**, resulting in **12-16% operational disadvantages** compared to PLI awardees
- This could further **stifle innovation** and limit **risk appetite** amidst startups, limiting innovation in the EV sector

Current PLI structure is narrow in its focus on outcomes:

- Current structure of the scheme doesn't incentivize **ecosystem level development**, due to narrow focus limited to **DVA in manufactured goods**
- However, there are other, equivalently critical outcomes that can be tied to the PLIs – for e.g. R&D, Workforce, Exports)

Sources: Mint, PLI-Auto adds three more firms to the roster, 2025; PIB, PLI Scheme for Automobile & Auto Components driving investments, employment and growth, 2025

C **Capital Equipment & Infrastructure** | Expanding PLI scope and boosting inclusivity are key measures to improve effectiveness of PLI funds in driving ecosystem level development for domestic EV manufacturing

Structural modifications for PLI Schemes

1 *Separate set of threshold limits for small-scale actors*

- **Re-evaluate PLI process and eligibility criteria** to make them friendly to startups and MSMEs
- PLI status could **enable access to finance** and investment for **non-legacy actors**, **facilitating innovation** in the sector

2 *Tie PLI requirements to other critical sector outcomes*

- Expand **fund disbursement metrics** to track broader **ecosystem outcomes** (e.g., number of patents filed, job creation, export volume)
- Widening PLI focus could result in **innovation and scale-up** across **upstream** (REOs, Rare Earth Magnets) and **downstream segments** (new-tech based components)

SECTION TWO, SUB-SECTION E

GREEN HYDROGEN INDIGENISATION PATHWAYS

Key investments would be required from the government to kickstart and maintain demand and ensure cost-competitiveness, some of which is already budgeted

Government funding of ~INR 8,400 Cr would be required across demand acceleration, R&D, workforce skilling and subsidies on capex and interest by 2030 to achieve these goals

Theme	Total Funding Required (INR Cr)	Government Funding Required (INR Cr)	Key Activities	Potential outcomes
Demand & Market Architecture	5,836	5,836	Leverage existing NGHM budget of INR 19,000 Crore to allocate additional INR 5,800 Cr to reduce price impact on consumers in fertilisers, steel, and CGD sectors	Additional subsidies for fertilisers, steel, and CGD will help absorb price impacts on the consumers
R&D & Product Innovation	250	125	Leverage existing R&D and testing infra budgets totaling to ~590 Cr to fund at least 50% of the additional required mission-mode dev and testing labs	Mission-mode labs for development and industry grade integrated testing labs will help accelerate lab to commercialization and ensure uniform testing standards
Upstream Raw Materials & Critical Inputs	-	-	Raw material dependency to continue in the near term; explore long-term pathway of circularity that could require investments, but beyond 2030	Long-term circularity for PGMs and other low-reserve minerals could help reduce import dependency
Capital Equipment & Infrastructure	12,120	236	Provide interest subvention for setting up heavy equipment for roll-to-roll production and die cutting for membranes, coatings, and stamping for bipolar plates	Upfront investments in capital infrastructure will help localise manufacturing of electrolysers and critical stack components, thus enabling higher DVA
Talent & Workforce	200	200	Leverage existing INR 35 crore NGHM skilling budget, 1% of ITI budget, and 1-3% of CSIR budget for targeted interventions across trainers, curriculum, industry participation, and infrastructure	Early investments in skilling will ensure a job-ready workforce for upcoming electrolyser manufacturing and green hydrogen production plants
Cost Competitive-ness	1,980	1,980	Introduce additional INR 1,980 Crores for absorbing the cost differential of domestically manufactured electrolysers vs. those that are imported as prices are not going down enough through existing PLIs	Support would ensure that the proposed introduction of DVA requirements and domestic electrolyser usage in overall green hydrogen production is economically feasible for developers
TOTAL	20,386	8,376		

Policy interventions are needed in the near-term to ensure green hydrogen production costs are comparable to grey hydrogen

Subsidies to ensure stability across fertiliser, steel, and CGD sectors could reduce production cost of green hydrogen by 38% vs. current costs, ensuring cost competitiveness with grey hydrogen

Subsidies have proven to be effective in maintaining price stability in the fertiliser sector, and could be expanded

- Green Ammonia tenders have seen rates as low as INR 2.6/kg owing to subsidies of ~INR 1,500 Cr & offtake agreements led by government
- However, this forms only 1/5th of 2030 projected fertiliser demand

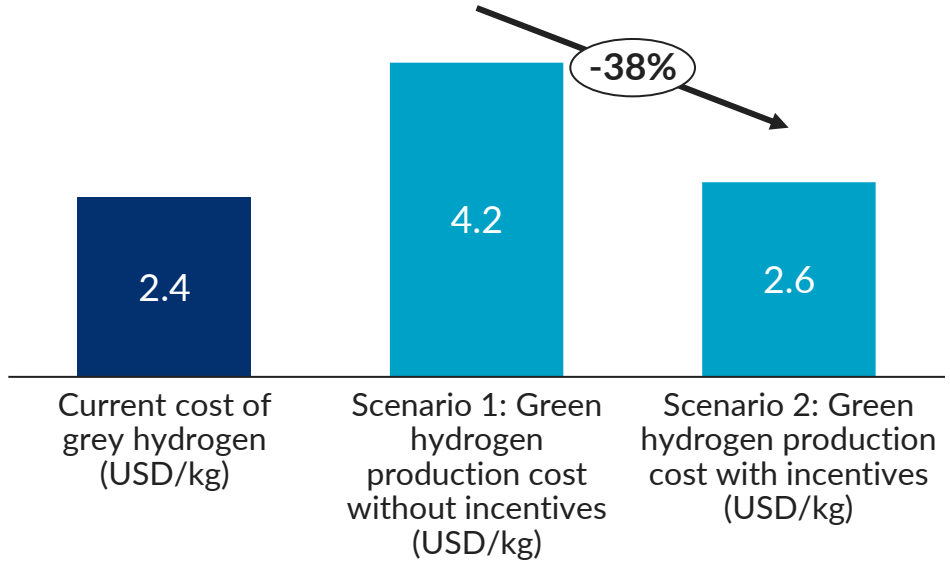
Sectors such as steel and city-gas distribution (CGD) may not be able to absorb the increased cost themselves

- Steel and CGD with green hydrogen use in large public-sector projects and for exports, would need interventions to stabilize production costs
- Refinery is expected to absorb the marginal cost increase of 0.5-1% while transport sector already receives **INR 500 Cr** from state governments

Proposed interventions:

- Expand subsidy for green ammonia to entire 2030 projected fertilize r demand, involving an additional **~INR 5,000 Cr** investment
- Support steel and CGD sectors with a subsidy of **~INR 836 Cr** to ensure competitive costs for public sector projects, and for export competitiveness of green steel

Comparison of grey hydrogen and green hydrogen production costs



Targeted subsidies to absorb cost increases
~INR 7,800 Cr till 2030

Notes. 1. Assumes that green ammonia tender prices can be extended to remaining fertiliser demand for 2030; 2. Assumes that marginal cost increase in refinery sector will be absorbed by the sector
Source: CII report, 2025; CEEW & Dalberg analysis

Detailed in Annex

Capital investment of ~INR 688 – 1,456 Cr would be needed to set up the heavy machinery required for in-house component manufacturing

Electrolyser	Equipment	CAPEX per system[1]	Throughput	Effective electrolyser capacity per system[2]	Required CAPEX (Conservative)	Required CAPEX (Optimistic)
Alkaline	CCM - Plasma coating	INR 39.4 Cr	179 m^2/hr	2.2 GW	**157.6 Cr**	**INR 315.2 Cr**
	CCM - Die cutting	INR 1.3 Cr	7000 parts/hr	14.3 GW	**INR 1.3 Cr**	**INR 2.6 Cr**
	BPP - Stamping	INR 15.7 Cr	660 parts/hr	1.3 GW	**INR 94.1 Cr**	**INR 203.9 Cr**
	BPP - Physical vapor deposition	INR 4.0 Cr	12 m^2/hr	0.1 GW	**INR 235.3 Cr**	**INR 502.5 Cr**
	PTL (Anode + Cathode) - Electrodeposition	INR 1.1 Cr	12 m^2/hr	0.1 GW	**INR 107.3 Cr**	**INR 227.7 Cr**
PEM	CCM - Slot die coating	INR 39.4 Cr	179 m^2/hr	23.0 GW	**INR 39.4 Cr**	**INR 39.4 Cr**
	CCM - Die cutting	INR 1.3 Cr	7000 parts/hr	142.8 GW	**INR 1.3 Cr**	**INR 1.3 Cr**
	BPP - Stamping	INR 15.7 Cr	660 parts/hr	13.4 GW	**INR 15.7 Cr**	**INR 15.7 Cr**
	BPP - Physical vapor deposition	INR 4.0 Cr	12 m^2/hr	1.0 GW	**INR 8.0 Cr**	**INR 39.9 Cr**
	Anode PTL - Sintering	INR 19.6 Cr	120 parts/hr	2.4 GW	**INR 19.6 Cr**	**INR 78.2 Cr**
	Anode PTL - Physical vapor deposition	INR 4.0 Cr	12 m^2/hr	1.4 GW	**INR 8.0 Cr**	**INR 27.9 Cr**
	Cathode PTL - Die cutting	INR 1.3 Cr	7000 parts/hr	142.8 GW	**INR 1.3 Cr**	**INR 1.3 Cr**
Total					**INR 688 Cr**	**INR 1,456 Cr**

1. CAPEX required for a system of the given throughput, includes installation and building costs; 2. Total electrolyser capacity that can be supported annually by one manufacturing system, calculated using system throughput and stack specifications of 1 MW system; 3. Throughput for plasma coating system assumed to be the same as slot-die coating system. Sources: CEEW, NREL (2024), CEMAC – NREL (2017)

SECTION TWO, SUB-SECTION F

TRANSMISSION EQUIPMENT INDIGENISATION PATHWAYS

An estimated INR 22,200-26,500 crore will be needed to build domestic HVDC manufacturing, along with INR 3,000–4,000 crore of targeted viability funding for remote HVDC corridors

Government funding will be required across R&D, workforce development, and capital subsidies to establish India as a leading manufacturer of advanced HVDC systems by 2032

Theme	Total Funding Required (INR Cr) - approx	Government Funding Required (INR Cr) - approx	Key Activities	Potential Outcomes
Demand& Market Architecture	3,400-4,500	3000-4000	Set up HV transmission projects of ~6 lakh ckm by 2032. Government to provide viability gap funding to remote HVDC projects[1]	Sufficient transmission capacity to evacuate more than 250GW of renewable energy planned by 2032 across India and cross-borders
R&D & product Innovation	1,000-1,300	500-780	Set up 2–3 System Studies Labs in universities, 1–2 Equipment Design & Small Test Bays and 1 Central Large Hardware Test Facility	Indigenous development of HVDC technologies;
Upstream Raw Materials & Critical Inputs	450-700	80-120	Provide input subsidies up to 20% on domestic copper recycling and HV epoxy resin manufacturing plants[2]	Reduce import dependency on Copper cathodes used in transmission systems by 30-40 % of total demand
Capital Equipment & Infrastructure	22,200-26,500	2,200-2,600	Expanding HVDC manufacturing ecosystem will require INR 19.2-23K Cr investment. Provide 5 - 10 % Production Linked Incentives on HVDC component manufacturing (reactors, filters, DC capacitors, etc.[3])	Reduce import dependence from 100% to complete localisation of critical HVDC switchgear and converter valve components
Talent & Workforce	250-280	75-80	Setting up Center of Excellence for training the workforce in HVDC systems; Train ~8000 skilled workers through new courses & apprenticeships	Ensuring a stable supply of skilled workers in HVDC systems; build capabilities to carry our globally competitive R&D in HVDC
TOTAL	27,200-33,200	5,900-7,600		

(1) Assumed funding support needed for Leh-Kaithal, project costing approximately 50% of the Ladakh – Kaithal project that received INR 8000 Cr funding from Green Energy Corridors; (2) Assumed a plant of 1ktpa of HV epoxy resin could be set up as a brownfield plant within a domestic epoxy resin factory with 1.5-2x times the capex required for HV grade manufacturing. 1ktpa is higher than domestic need and hence expected to be built for export opportunities as well (3) Includes large HV testing infrastructure which is assumed to be non existent in India and accounts for a significant share of the Capex for manufacturers. Some of the components such as DC capacitors need to be set up at scale targeting exports as well to be commercially viable; Source: Dalberg Analysis

Thank you!