

Envio

Competitive Market Analysis

This document provides a comprehensive comparison between **Envio** Lithium Iron Phosphate (LFP) battery packs and other major brands and categories in the market. As an assembler focusing on high-quality cells paired with advanced Battery Management Systems (BMS), Envio is positioned to capture market share through reliability, safety, and performance.

LIB MARKET SIZE IN INDIA

The introduction of LiB has revolutionized numerous sectors, most prominently the EV industry. The adoption of LiB is accelerating in India as depicted in the figure below. JMK Research estimates that the annual LiB market in India will reach 116GWh in 2030, with EVs accounting for ~90 % of the overall market on the back of huge government targets of adding variable renewable energy sources to the grid. This will lead to higher use of energy storage solutions, a push towards electric mobility and increasing consumer demand for EVs. The total market size includes current and forecast market size for both automotive and non automotive applications. The non-automotive segment includes grid-scale RE, rooftop solar (RTS), telecom towers, uninterrupted power supply (UPS), solar street lights, etc. For EVs, the battery size of two-wheelers taken is 2kWh, three-wheelers (e-rickshaw and e-auto) 5kWh and 10kWh respectively, four-wheelers 40kWh and buses 250kWh. Total sale of EVs is estimated to increase from 1.1 million in FY2021 to 17.8 million by 2030.

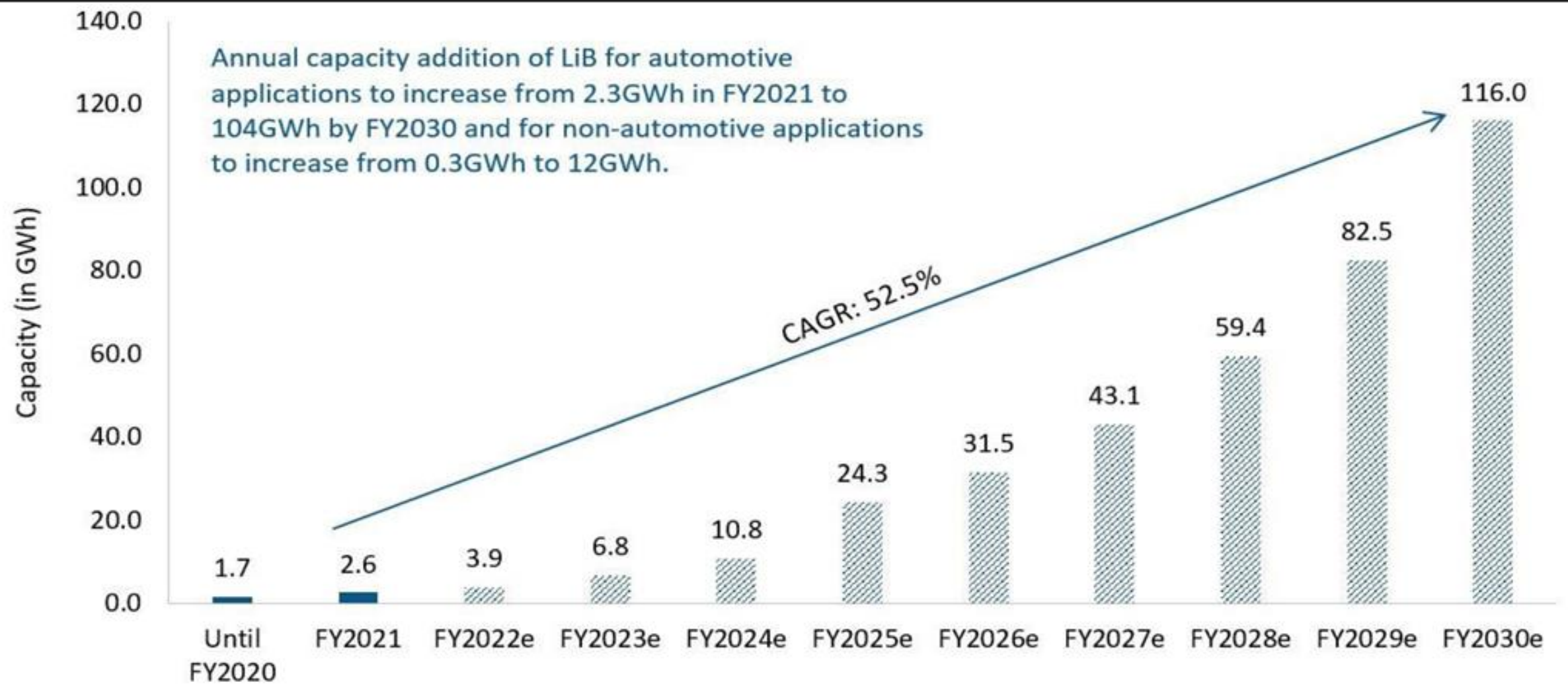


Fig.1. LiB Annual Additions in India, GWh

1. Executive Summary

The energy storage market is rapidly transitioning from traditional lead-acid to LFP technology. Envio offers a unique balance of premium performance, intelligent safety features, and cost-effectiveness by assembling specialized packs. This analysis benchmarks Envio against premium Tier-1 brands (e.g., Battle Born, Dakota Lithium), budget white-label imports, and legacy Lead-Acid/AGM solutions.

2. Why Choose ENVIO?

Advanced LFP battery technology for enhanced safety and long life.

3500+ cycle life reduces replacement costs significantly.

Smart BMS protection for overcharge, short circuit, temperature, and voltage control.

Fast charging support for reduced downtime.

Strong metal casing for industrial durability.

Suitable for EV, inverter, and solar applications.

3-year warranty with professional support.

BIS, IEC, and ISO compliant manufacturing standards.

3. Technical and Performance Comparison

Metric / Feature	Envio LFP Packs	Premium Competitors (Tier-1)	Budget LFP Imports	Traditional Lead-Acid (AGM)
Cell Chemistry	Grade-A LiFePO4 (LFP)	Grade-A LiFePO4 (LFP)	B-Grade / Mixed LFP	Lead-Acid
Cycle Life (at 80% DoD)	3,000 - 4,000 cycles	3,000 - 3,500 cycles	2,000 - 3,000 cycles	300 - 500 cycles
BMS Integration	Advanced Custom smart BMS (Active Balancing, Multi-point Temp Control)	Standard/Advanced BMS	Basic BMS (Passive or None, prone to failure)	N/A
Low-Temp Charging Protection	Included (Automatic Disconnect / Optional Heating)	Included (often requires premium model)	Rarely Included	N/A (Performance drops significantly)

Weight & Energy Density	High (Optimized, lightweight Pack Design)	High	Variable (bulky cases)	Very Heavy (~30-40 <u>Wh</u> /kg)
Usable Capacity	~100%	~100%	80-90% (Due to poor cell matching)	50% (To prevent battery damage)
Body Construction	Heavy Duty Metal Casing	Average metal	Plastic	Plastic
Efficiency	High Energy Efficiency	Standard Efficiency	Low efficiency	Poor efficiency
Ideal Customers	Residential, Commercial, EV	Residential	Residential	Residential
OEM/Dealer Support	Available	Limited by Segment	Limited by Segment	Limited by Segment
Technology Positioning	Modern Smart Lithium Solution	Conventional Power Backup Focus	Power storage	Power storage



4. Envio's Key Differentiators

- **In-House Assembly Quality:** Strict quality control during the cell-to-pack assembly process ensures highly matched internal resistance across all cells. This drastically reduces the workload on the BMS and extends the overall lifecycle of the pack.
- **Smart BMS Architecture:** Unlike budget brands that use generic circuit boards, Envio packs feature a robust BMS that provides real-time monitoring of voltage, current, and temperature, strictly preventing overcharge, deep discharge, short circuits, and thermal runaway.
- **Scalability and Integration:** Envio packs are engineered for seamless parallel and series connections, making them highly adaptable for 12V, 24V, and 48V+ system configurations.
- **Supply Chain Transparency:** Direct assembly allows for better oversight of cell sourcing and manufacturing consistency, mitigating the supply chain risks associated with drop shipped or rebranded white-label imports.

5. Application Suitability

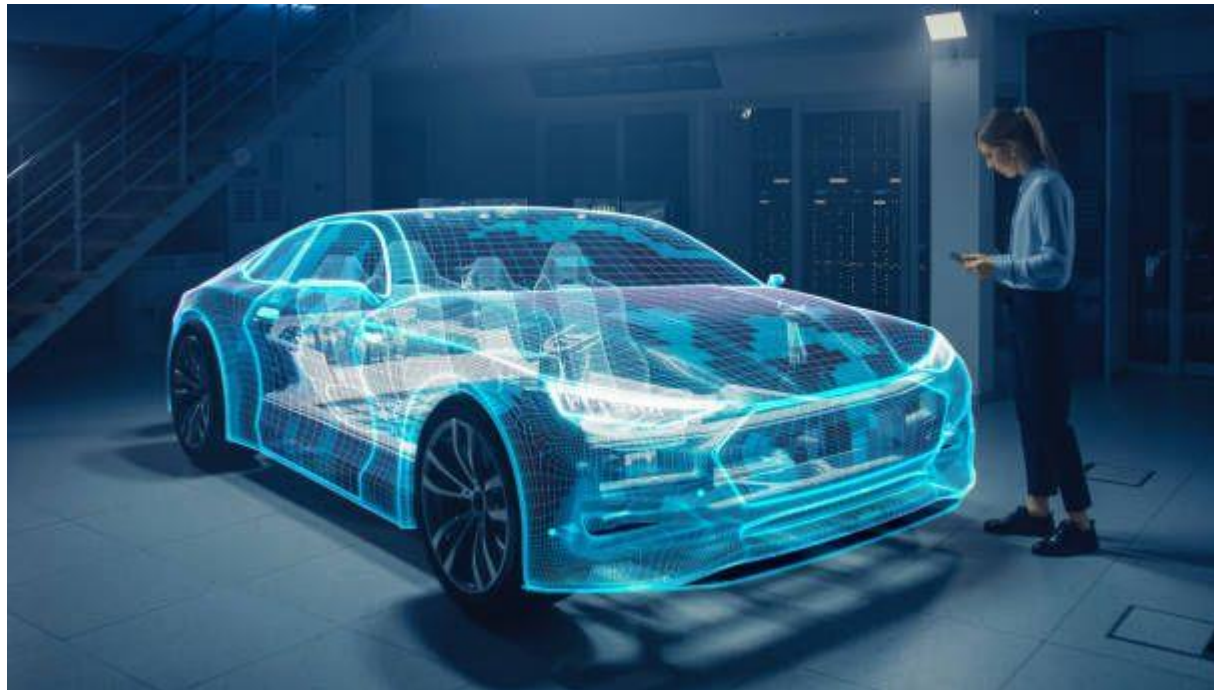
Target Sector	Envio Market Positioning	Competitor Landscape
Solar / Home Energy Storage	Excellent - High cycle life and safe chemistry make it ideal for daily deep cycling.	Dominated by high-cost proprietary systems (e.g., Tesla Power wall). Envio offers a much better ROI for DIY or modular setups.
RV & Marine (Leisure)	Excellent - Lightweight, vibration-resistant, drop-in replacements for lead-acid.	Premium brands are strong here, but charge high markups. Budget brands often fail on vibration/durability testing.
Industrial / EV	Strong - High continuous discharge and peak surge rates handled safely by the heavy-duty BMS.	Currently transitioning from Lead-Acid. Envio can capture this with aggressive B2B fleet pricing.

APPLICATIONS

- Currently, the end-use applications creating demand for LiB include the following:

• 5.1 Automotive

LiBs have become an integral part of the EV ecosystem. The Government of India has set a target of electrifying 30 % of private cars, 70 % of commercial vehicles, 40 % of buses, and 80 % of two- and three-wheelers by 2030. Add to that, the creation of favorable policies by the central government such as the Faster Adoption and Manufacturing of Hybrid & EV (FAME) scheme Phase-II (FAME-II), which offers incentives to EV buyers to boost EV adoption in India.



5.2 Non-Automotive

- LiBs are expected to play a crucial role in other applications. As demand for variable renewable energy sources such as solar and wind keeps growing, there will be an increasing need to store the excess energy to improve the flexibility of these sources. And LiBs are preferred due to their higher charge/discharge rates and higher cycle life. With Reliance's mobile towers using ~100 % LiB and other telecom operators also rapidly adopting LiBs in their towers, the demand for these batteries is bound to increase. All new data centers in India have shifted to LiBs for power backup instead of LA batteries, further increasing demand. The non-automotive market, presently dominated by the telecom segment, is represented by lithium iron phosphate (LFP) in terms of battery chemistry. LFP batteries are based on a prismatic form factor for large storage applications, and cylindrical cells for small storage applications of below 1 kilowatt hour (kWh) such as solar streetlights.



5.3 Telecom Towers

- The primary reason for telecom tower companies to adopt LiB is to minimize diesel-use amid economic and environmental pressures. Theft of diesel generators in some regions has led telecom companies to look for generator-free options. Further, advent of 5G technology will require mini-towers and hence mini-cells, which will require small battery packs that fit in smaller spaces and are easily replaceable. Lithium-ion cells can offer that solution. The increasing number of towers will require fresh LiB installations. Secondary demand will arise due to LiBs that will need to be replaced by 2025 in towers that were installed before 2019.



5.4 Uninterrupted Power Supply (UPS)

- The UPS market in India is expected to grow by ~10 % y-o-y on the back of simultaneous growth in demand for power vis-à-vis the availability. The growing demand for digitization along with increasing requirement for power backup in the commercial and industrial sectors is expected to drive this. The highest demand for UPS is expected to be from healthcare and data center applications. At about half the size and less than a quarter of the weight of LA batteries, as well as having a higher cycle life of 2,500 compared to ~300 for LA technology, LiBs are regarded as the batteries of the future.



5.5 Grid-scale Renewable Energy Integration (RE)

Batteries are expected to play a major role in increasing the flexibility of RE systems. As of March 31, 2021, India has installed about 30 megawatts (MW) of solar with 19.27MWh of grid-scale battery storage projects. This includes a 10MW/10MWh solar + battery storage project in Delhi and a 20MW/8MWh solar + battery storage project in Andaman & Nicobar Islands.

The grid-scale battery storage market in India is still a few years away. The high cost of LiBs is more apparent in this market owing to large-scale energy storage requirements. Nevertheless, with the ongoing pace of RE capacity addition in India, the scope for LiB-based grid scale storage continues to widen. To “flatten” the varying RE-integrated power supply curve to ensure stability of the grid, it is necessary to have a reliable battery energy storage system (BESS) that can store surplus renewable power and later, inject firm power into the electricity network. Solar and wind projects in India now require ever-increasing amounts of battery storage to meet the generation needs of multiple peaks during the day. The power utilities’ concern for grid balancing and security will drive the demand for BESS supported RE projects, with the objective of firming-up RE power. Many new RE tenders issued in India are now either for peak power supply or round the clock (RTC) power generation. In all such tenders, storage is imperative to maintain the capacity utilization factor (CUF) requirement of the plant. With the need for an assured RE-integrated power supply bound to grow significantly in the future, lithium-based BESS will become critical in this market segment.

5.6 Rooftop Solar (RTS)

- A vast majority of operational distributed (On-site/Rooftop) solar-plus-storage projects utilize the LA battery system as their storage component. LiB technology has only emerged recently in the distributed solar market. In light of restrictive measures by many state-run utilities on net-metering and electricity banking in the grid, which essentially restrict the “buying” and “storing” of surplus energy, there are increasing opportunities for the rooftop solar-plus-BESS market. In the diesel replacement sub-segment, distributed solar-plus-storage has a potential of ~100GW (which is equivalent to the latent capacity of diesel generators in India).



5.7 Consumer Electronics

The increasing use of LiBs in smartphones, laptops, and elsewhere is driving LiB growth across the globe. Historically, consumer electronics have dominated the battery market, guiding innovation in technology design and configurations. Projected growth for consumer electronics is not as high as EVs, yet the Indian appliances and consumer electronics market is expected to double in the next two to three years, reaching Rs2 trillion (US\$27b), according to Consumer Electronics and Appliances Manufacturers Association (CEAMA).⁵ Given the linear dependence of consumer electronics on LiBs, these batteries have a major role to play in realizing these projections.

5.8 Material Handling Equipment

In India, the concept of automated MHEs or Automated Guided Vehicles (AGVs) is new and its acceptance has picked up in the last couple of years. The COVID-19 pandemic demanded safety and contactless operations while also leading to a shortage of manpower, which in turn created scope for AGVs. In addition, the pandemic changed the consumer buying behavior, triggering massive online purchasing. This provided a fillip to already booming e-commerce and led the Indian e-commerce giants to introduce robot-based sorting technologies including AGVs.

5.9 Power Tools

- LiBs are used in band saws, drills, and crimpers. The strengths of LiB for power tools include ease of use, longer run times, flexible charging, and fewer short circuits. In addition, the battery will not discharge if stored for an extended period. To serve the power tool applications, LiBs have been modified to operate at high discharge rates. So, while the standard LiBs have 1C or even lower discharge rate, high-power LiBs typically possess 10C or higher C-rate.



6. KEY PLAYERS IN THE LIB MARKET IN INDIA

- Of the total cost of LiBs, cells account for 65 %, the battery pack 15 %, BMS 15 %, and the balance being the outer box. To date, battery pack and associated BMS manufacturing have entirely dominated the space in India. Indian manufacturers are able to produce most of the sub components that go in a battery pack viz-a-viz copper harness, terminal, non-reactive glue, and outer casing, while thermal pads still need to be imported. Similarly, BMS and outer box are also primarily supplied by the Indian battery pack assemblers only. However, since India does not have BMS manufacturing components, it sources pre-programmed protection circuit board (PCB) from China and undertakes printing in India. The LiB pack manufacturing market in India is fragmented and comprised of numerous active players including Coslight India, Okaya, Exicom, followed by Trontek, Amptek, Cygni, Grinntech, Lohum Cleantech, Pure EV etc.
- In terms of battery chemistry, the LiB pack industry has been serving E2W and E3W OEMs as well as stationary markets with a mix of LFP and Nickel Manganese Cobalt (NMC) batteries. While NMC is used in E2Ws and e-cars, LiB-based E3Ws are powered by LFP-type cells. In addition, Indian E2WOEMs like Okaya have increasingly used LFP in their new models. However, EVs worldwide primarily use NMC chemistries. China, an exception, sticks with LFP chemistry for its e-buses, e-bikes, and cheaper cars.

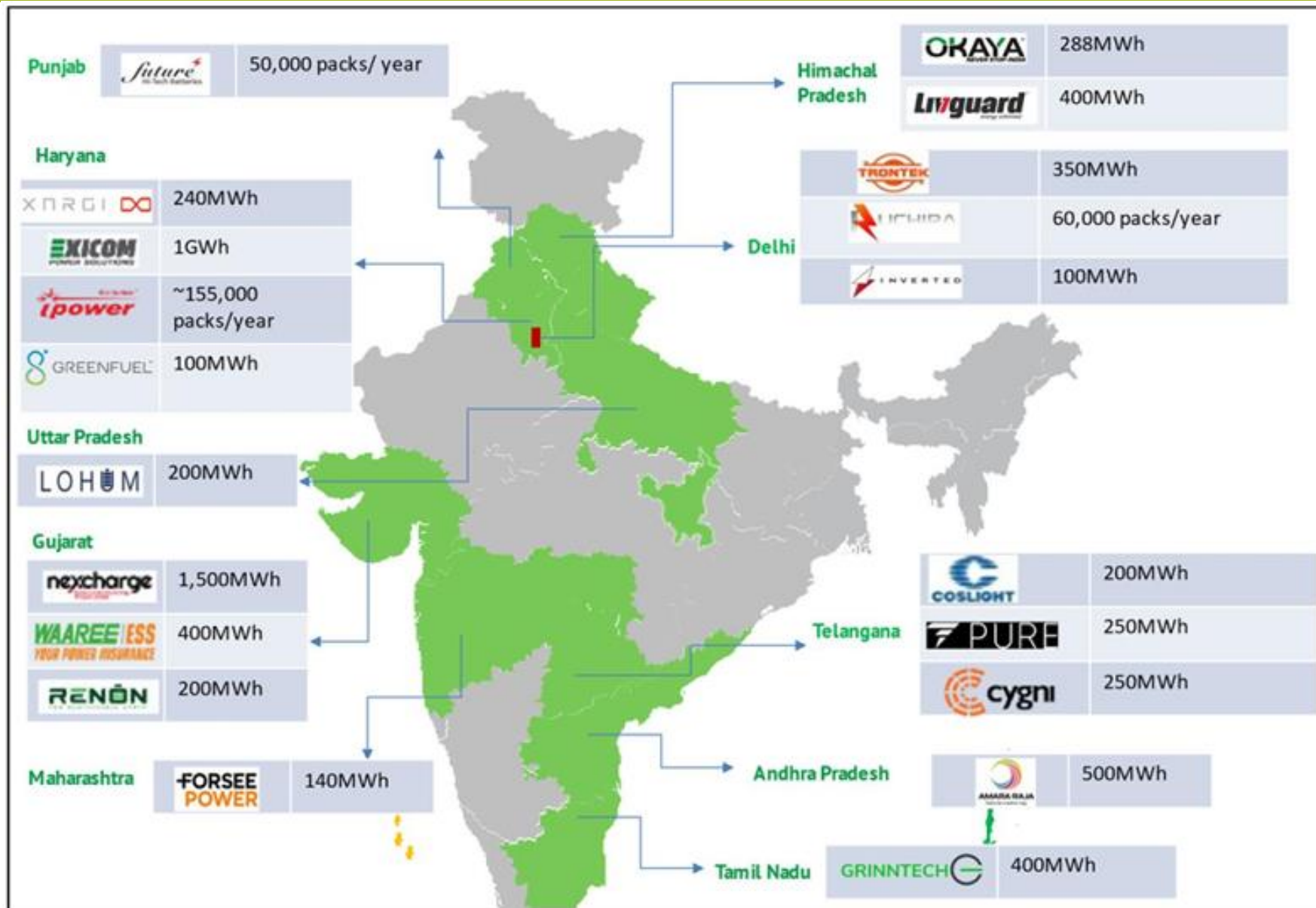


Fig.2. Existing Capacities of Key LiB Battery Pack Manufacturers

7. MARKET DRIVERS

The Indian battery manufacturing market is making great strides on the back of policy initiatives introduced by the central and state governments and the inherent low-cost manufacturing advantages offered in India.

7.1 Government Policy Initiatives

The Government of India has set an ambitious target for 2030: 30 per cent of new vehicle registrations to be electric and 450GW of renewables. To address this, it has focused its efforts on developing the value chain for the most important component of a battery, i.e., cells, and is encouraging local manufacturing of lithium-ion cells. In the same vein, the Indian Government doubled import duty on lithium-ion cells to 10 per cent from April 2021. The PLI ACC scheme announcement to encourage domestic production of cells is also a step in that direction.

The government had already introduced measures to encourage manufacturing of battery packs in India. It trebled import duty on assembled battery packs to 15% from April 2021.

Similarly, the requirement for EV manufacturers to assemble the traction battery packs locally to gain FAME-II incentives led to the proliferation of battery pack assemblers in India.

7.2 Production Linked Incentive (PLI) Scheme

The PLI scheme, introduced by the Government of India, offers incentives in 14 key sectors (including drones). This includes financial allocations of Rs181,000m (US\$2,461.6m) for Advanced Chemistry Cell (ACC) batteries under the National Programmed for Advanced Chemistry Cell (NPACC) and Rs259,380m (US\$3,410m) for automobiles and auto components with an emphasis on promoting local manufacturing. The Government of India expects huge investments of over Rs450,000m (US\$6,120 m) for the planned 50GWh capacity under the PLI ACC scheme. The scheme will help in achieving manufacturing capacity of 50GWh of ACC and 5GWh of “niche” ACC.

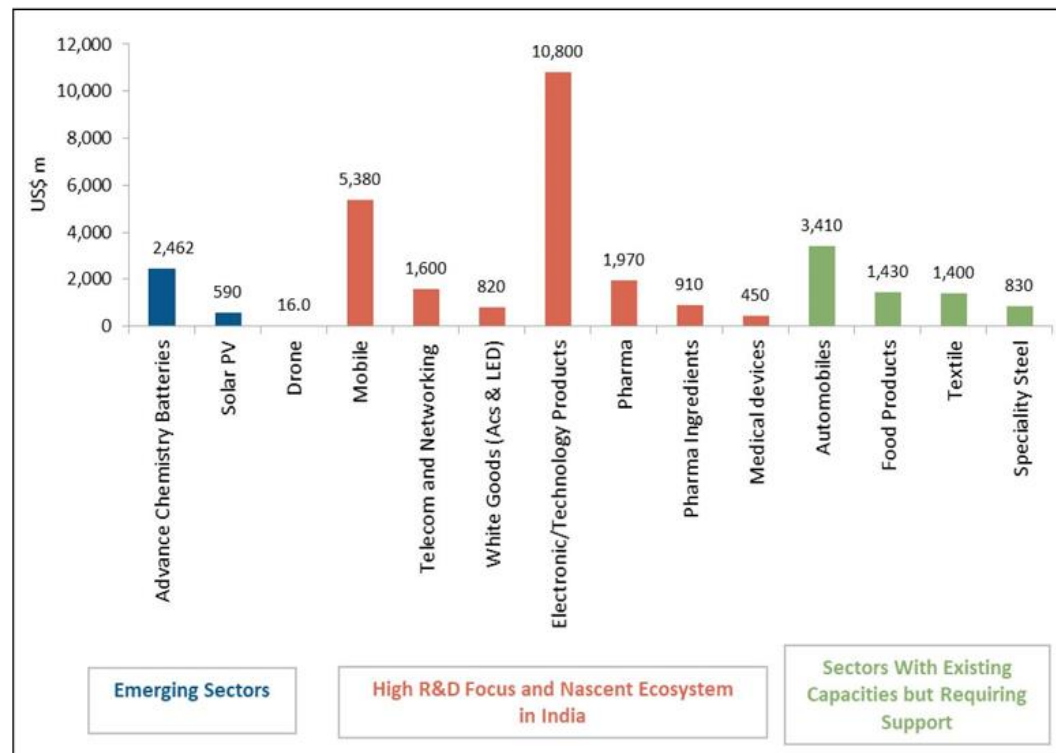


Fig.3. Fund Allocation Under PLI

7.3 FAME-II Scheme

The demand incentive for E2W has been increased by 50 per cent to Rs15,000/kWh (US\$205.7/kWh) of battery capacity as of June 11, 2021. So, an E2W with a 1kWh-battery will receive an incentive of Rs15,000 (US\$205.7) while one with a 3kWh battery pack will be eligible for an incentive of at least Rs45,000 (US\$617.1), given its ex-factory cost is over Rs100,000 (US\$1,371.3) and below Rs150,000 (US\$ 2,056.1). In addition, the limit on this incentive was doubled to 40 per cent of the ex-showroom price. This will result in the slashing of E2W prices by a considerable margin. The end result is expected to be an increase in production of such E2Ws and hence more demand for batteries.

7.4 100% FDI Permitted

The Government of India has encouraged new global players by permitting 100 per cent foreign direct investment (FDI). Meanwhile, no entry barriers exist for domestic players interested in the battery pack/BMS segment.

7.5 State-announced Incentives Under EV Policies

States are also promoting battery manufacturing with various incentives to build a complete ecosystem to drive this segment. When designing their EV policies, some states have announced incentives specifically for EV battery manufacturing/assembly. The green-shaded cells in the table below indicate the state provides battery manufacturing incentives/initiatives.

State	Capital Subsidies	Tax Exemptions and Interest Subsidies	Land Development Incentives	Battery Recycling Initiatives
Andhra Pradesh				
Delhi				
Karnataka				
Kerala				
Madhya Pradesh				
Maharashtra				
Meghalaya				
Odisha				
Punjab				
Tamil Nadu				
Telangana				
Uttar Pradesh				

Table 2: State-level Battery Manufacturing Incentives

7.6 No Significant Entry Barriers for Battery Pack Manufacturers

Apart from the government push via various policy measures and incentives, numerous other factors are leading to huge influx of investments, including: The initial investment to set up a battery pack manual assembly is as low as Rs100m (US\$1.3m) which is one of the reasons for the keen interest of so many players entering the market. The assembly of most of the battery packs in India is on manual and semi-automated assembly lines. This does not require capabilities and investments pertaining to Industry. The BMS in the battery packs must be of good quality but for now is not governed by any standards in India. Once a manufacturer procures cells and PCB design from a reliable source, the assembly of cells into modules and further into packs and BMS build-up is not difficult. All these advantages are drawing players that do not have any prior experience in battery manufacturing, among them small solar stationary providers and E2W manufacturers.

7.7 Low Manufacturing Costs

India is already the lowest cost country for manufacturing NMC pouch cells and the subsidies promised under the PLI ACC scheme could further reduce costs to US\$65/kWh. Land, labor, and utility costs are what determine the difference in manufacturing costs around the regions. Given that gross monthly minimum wage levels in India in 2019 were US\$65 against US\$217 in China and annualized real minimum wage growth over a period of 2010-2019 was 3.9% in India against 6% in China, India can achieve cost competitiveness with its close competitor and current exporter, China.

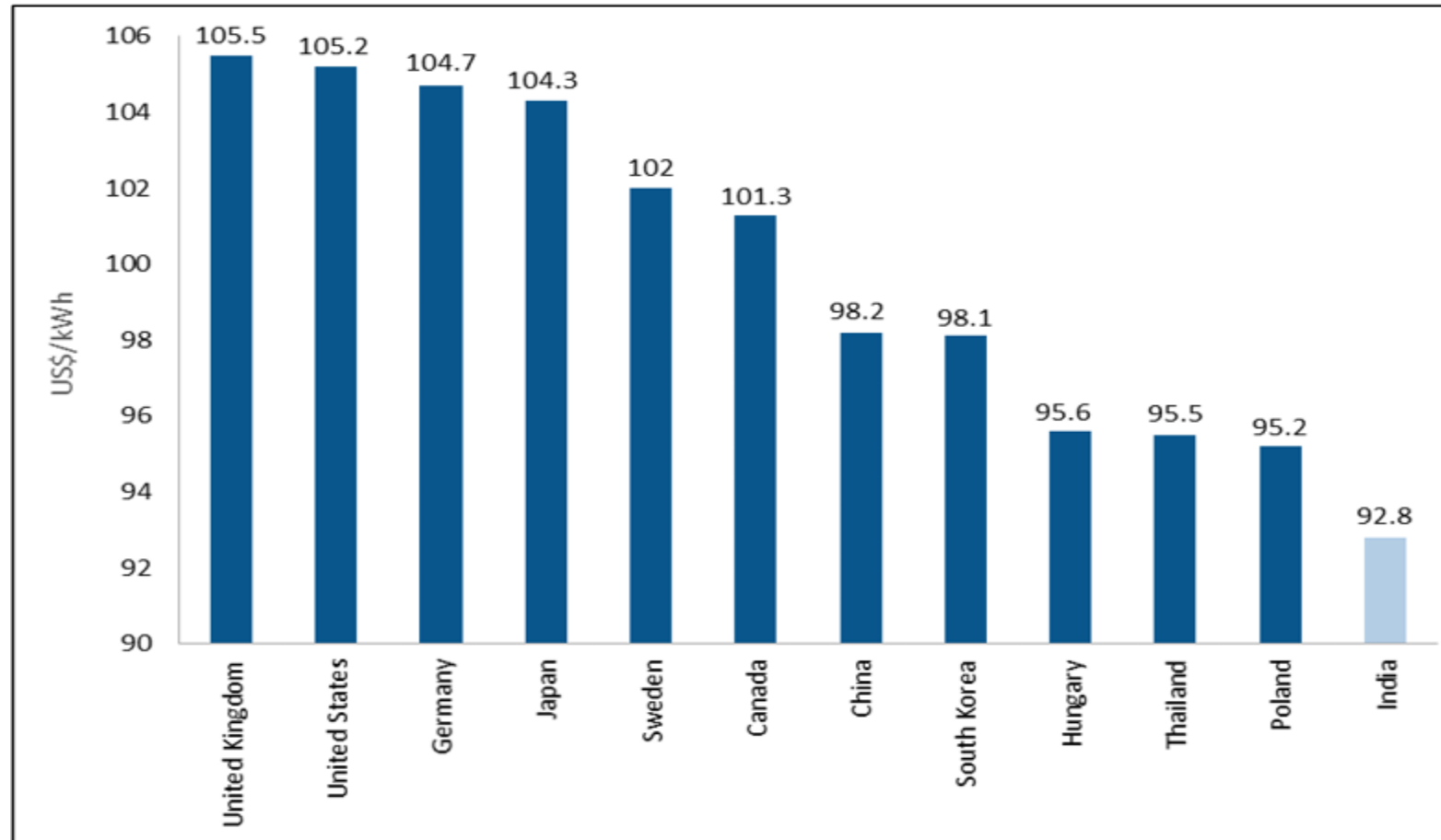


Figure 4: Country-wise Manufacturing Cost of Li-based Pouch Cell

7.8 Falling Battery Prices

- The Indian LiB market, by 2030, will primarily be driven by EVs as they will account for ~80 per cent of the entire demand. The drop-in battery prices from US\$1,220/kWh in 2010 to US\$132/kWh in 2021 has been the key driver for adoption of EVs in India and further reduction in prices will increase demand for vehicles and batteries alike. Despite the intense pressure from rising raw material and component costs, battery prices continued to fall in 2021. The drop-in prices led automakers and stationary storage developers to widely adopt LFP in 2021, helping offset the rising material costs.

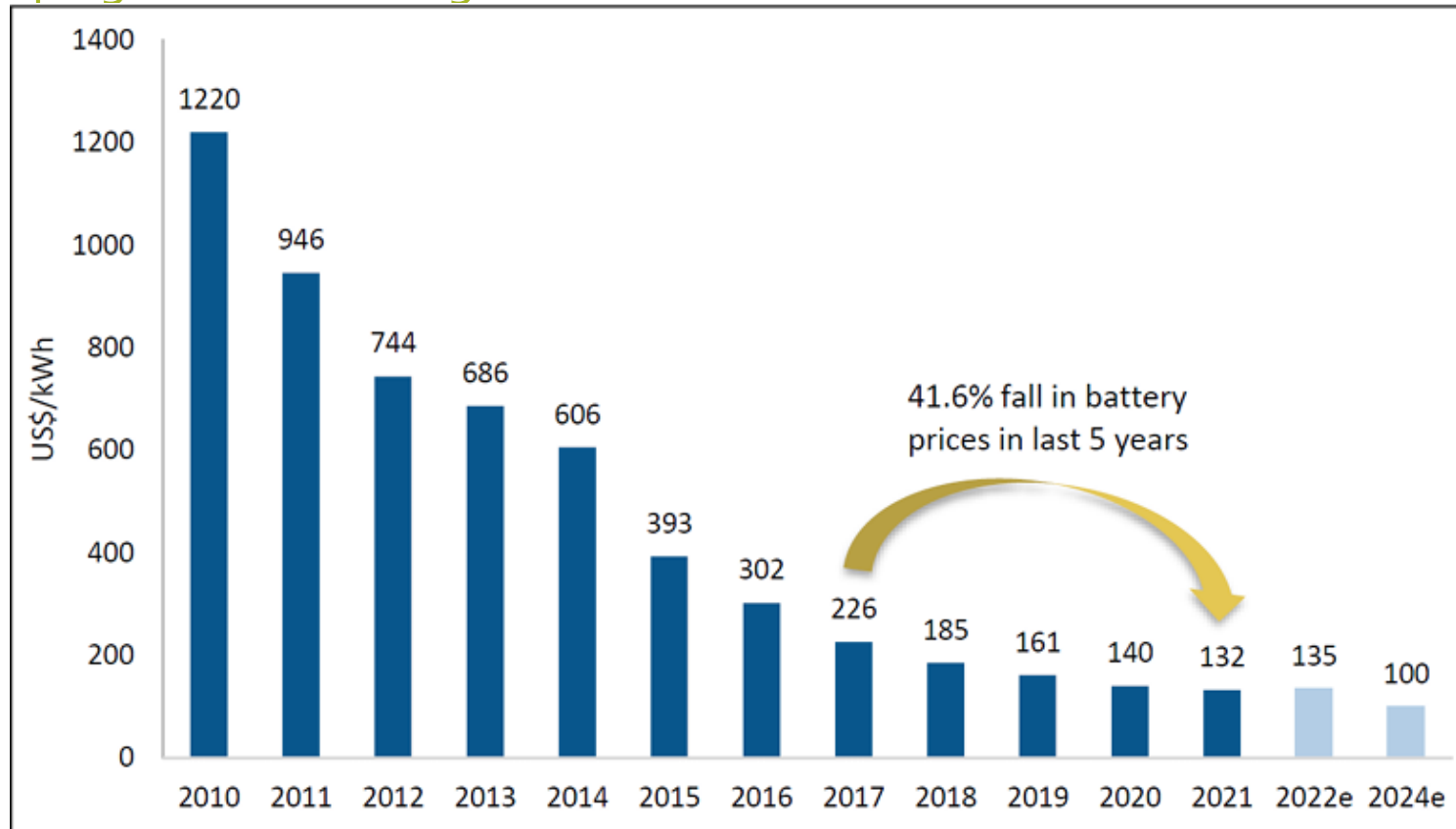


Figure 5: Volume-Weighted Pack Prices of Batteries

8. LIB MANUFACTURING IN INDIA – CURRENT CAPABILITIES & FUTURE NEEDS

- Lithium-ion cells constitute ~65 per cent of the entire battery in terms of cost composition. Conversion of lithium-ion cell to battery pack accounts for the remainder. In terms of cell production, raw materials account for about 77 per cent of the overall costs (Figure 6, Raw Material Component Cost) and manufacturing for the remaining 23 per cent (Figure 6, Manufacturing Cost).

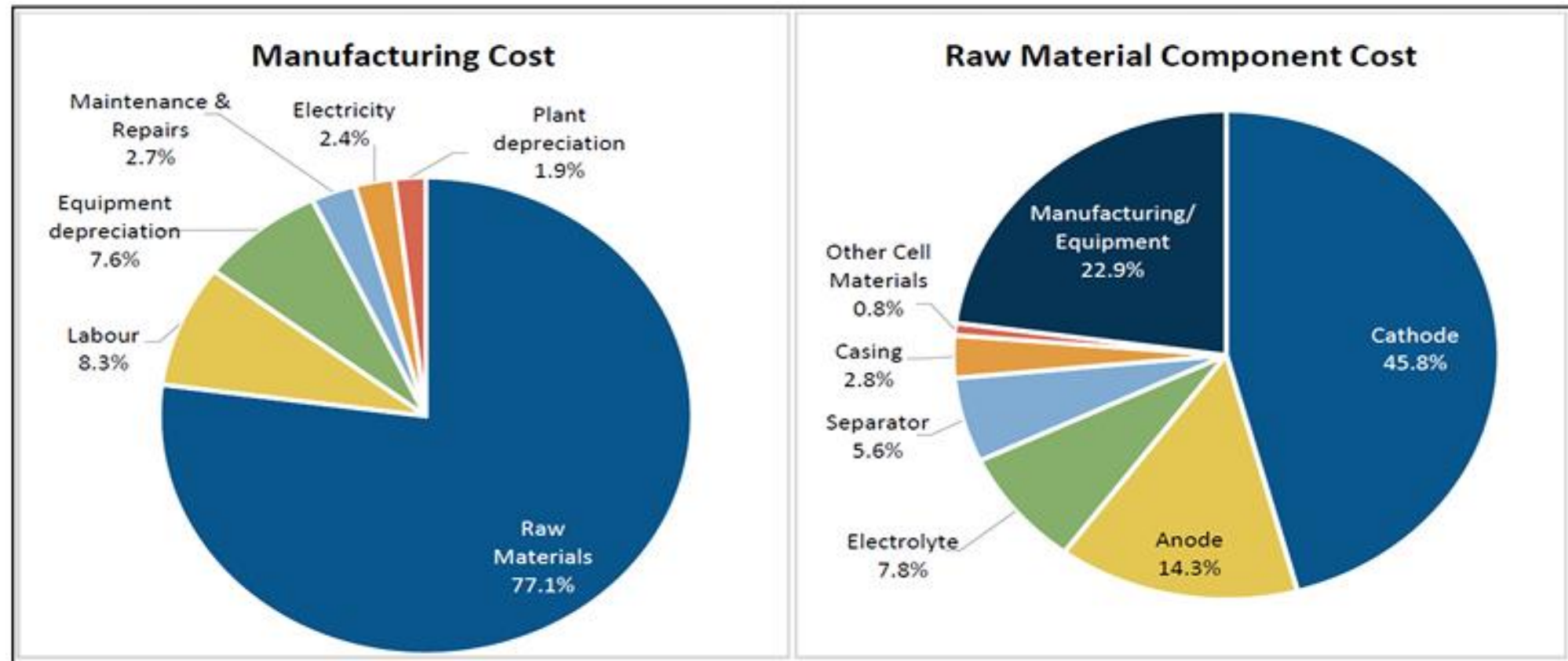


Figure 6: Manufacturing Cost and Component Cost Breakup for Cell Manufacturing

9. REQUIREMENT OF INDIAN TERRAIN-SPECIFIC CELL

- Though batteries have long been in demand in India, adoption of LiBs started when Reliance used them for its telecom towers with both the battery chemistries – LFP and NMC. The latter's chemistry couldn't withstand the high temperature requirements of $\sim 45-50^{\circ}\text{C}$ and hence caught fire -- LFP could, and this became the primary reason for the adoption of this chemistry type. LFP and NMC battery chemistries are most suitable for India. LFP is preferred where space is greater and life expectancy requirement is higher as in E₃W and traction applications. NMC is preferred where space availability is less, but energy density required is high as in E₂W and E-Cars. In conditions of more than 50°C , it is the LFP chemistry that succeeds. Stationary storage applications use LFP primarily for this reason. Similarly, for fleet operations in which an EV needs to ply in varying temperature ranges, LFP is best suited and the sole constraint is space. In India, NMC batteries typically last two to three years and LFP batteries, five to seven years so, given the option, LFP battery is more cost effective and techno commercially viable.

10. Dealer & Distributor Selling Points

- High-demand lithium technology market segment.
- Premium quality positioning with competitive pricing potential.
- Excellent product life improves customer satisfaction.
- Suitable for growing solar and EV sectors.
- Strong after-sales confidence due to smart safety systems.