Winning the EV race through localisation: An India perspective

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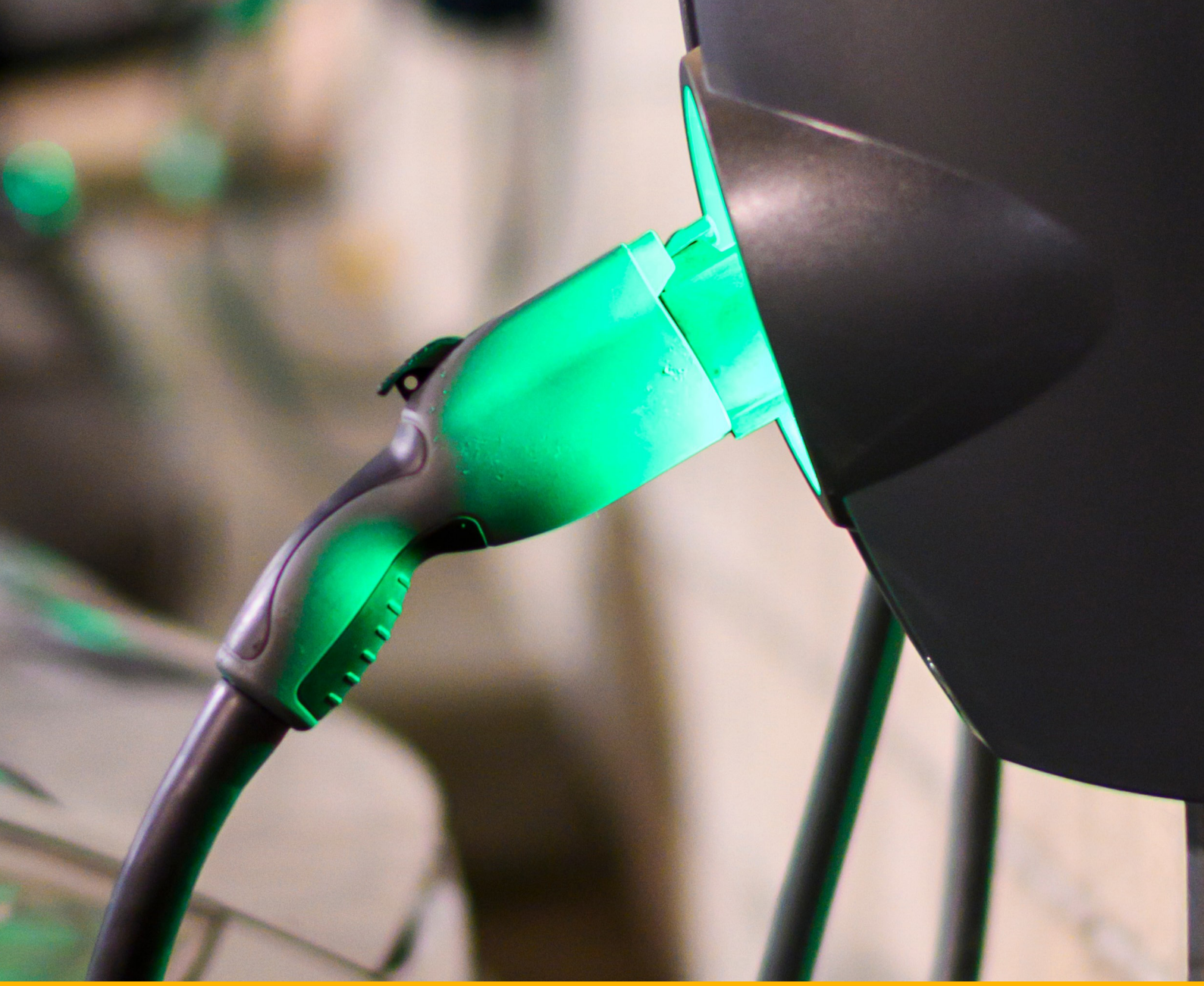


The regulatory push and the need to reduce exposure to supply chain volatility will drive localisation in the production of electric vehicles (EVs)

The auto supply chain has recently been under various macro pressures. In particular, production of EV components (e.g. cells and semiconductors) witnessed significant disruption due to the COVID-19 pandemic. As a result, EV original equipment manufacturer (OEMs) have had to prioritise short-term measures to secure supplies while procurement costs and country of origin assumed less importance. However, OEMs will need to balance these factors at the earliest to ensure local supply chain readiness for EVs.

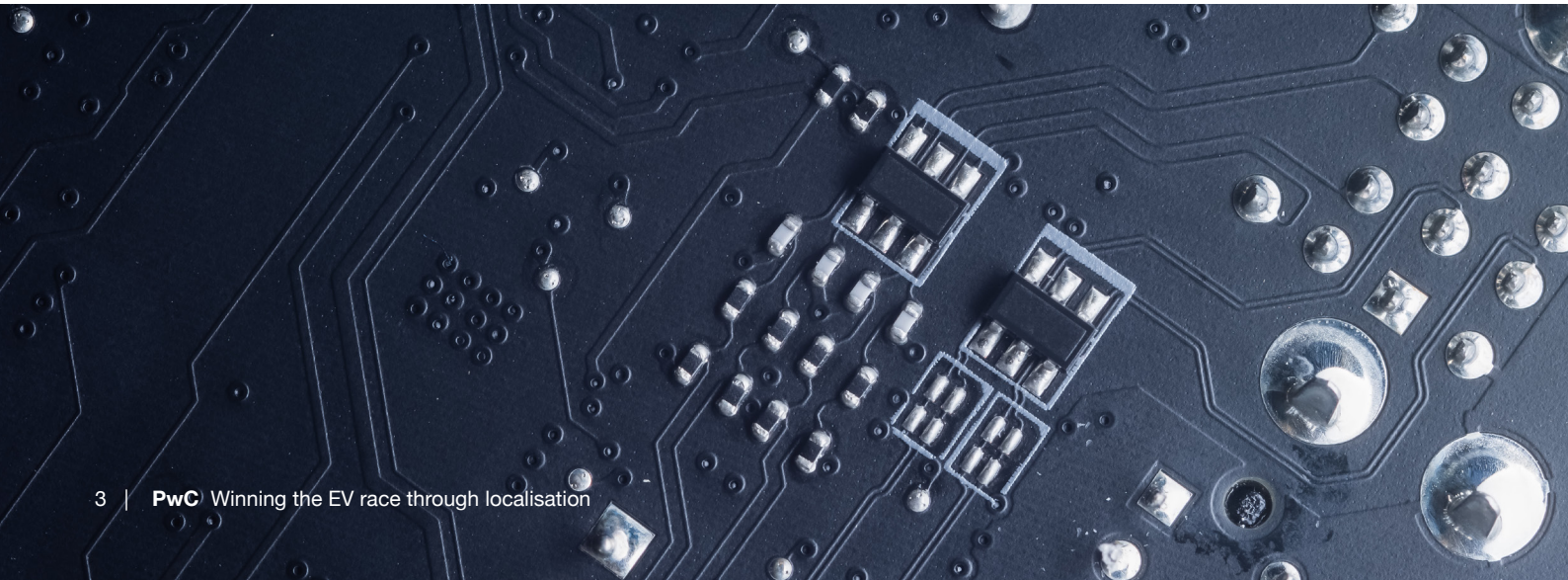
We believe that over the next 3–5 years, a strong push from various Government initiatives that create an enabling local ecosystem, coupled with the need for EV OEMs to stabilise and control the ever-growing spend on EV components, will drive localisation of the EV supply chain.

PwC's suggested levers for localising supply chains for OEMs

Multiple localisation levers can be explored for EVs – however, the contextualisation of these levers is very specific to the starting point of an OEM and needs to be carefully curated.

Localisation themes	Key considerations	Key levers
'Strategising' the steady-state supply chain	• EV market growth and share of business assumptions • EV platform roadmap • Capital allocation priorities • Supply chain availability • Government incentives and impact • Availability of start-ups/ new participants • Value proposition/offering	Take strategic decision on develop in-house vs procure – this will be specifically critical for high-content aggregates such as batteries, power electronics and electric motors/e-axles. Decide on investing/co-developing with emerging local players (start-ups) or global players planning to set up assembly in India. Invite existing suppliers to set up locally – partner with other OEMs to drive volume buy, especially for high-capital investment components such as connectors or low content per vehicle components such as thermal interface material (TIM).
Reinventing core functions for capability/ process interventions	• Vendor list refresh • Local value addition as vendor selection criteria • Platform standardisation across EV and ICE • Product/competition benchmarking • Should costing	For proprietary components under PLI, try securing supplies from vendors early to ensure future proofing. Relook at existing traditional components and ensure maximum localisation – e.g. aluminium raw material in alloy wheels. Focus on developing existing structural tier-1 suppliers for EV-specific requirements such as aluminium battery casings and lightweight castings/ forgings. Ensure high-component carryovers in EV design from existing ICE products to ensure reduced complexity. Design for local – instil local component availability philosophy at the design stage.

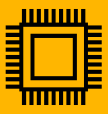
Source: PwC analysis



To begin with, OEMs will need to take strategic decisions to achieve a steady-state supply chain. This would entail balancing their insourcing plans and ecosystem-led collaboration.

Our conversations with industry indicate evolving thinking on this dimension – however, there could always be exceptions based on OEM strategy and ecosystem support.

Assembly of battery packs is likely to be controlled by OEMs – either in-house (mostly in the case of two-wheelers) or in partnership with reliable suppliers (likely to happen in the case of four-wheelers).



Critical systems such as battery management system (BMS) and vehicle control units (VCUs) are likely to be designed in-house given their strong impact on vehicle performance – however, assembly operations are likely to be subcontracted.

For motors, given the large volume requirements for two-wheelers, in-house and external suppliers are likely to co-exist. For in-house motor manufacturing, there is a possibility of subcontracting limited parts of the assembly operations.

Other high-voltage systems such as DC-DC convertors, onboard chargers and circuit breakers are likely to be sourced from tier-1 suppliers.

Source: PwC analysis

Our second localisation theme focuses on how OEMs will need to tweak the DNA of core functions like engineering and procurement to drive their localisation initiatives. This will require OEMs to invest strongly in benchmarking competing products in order to optimise their spend on imported components by leveraging in-house engineering and design capabilities.

EV localisation in India: On the cusp of rapid evolution

Localisation has always been a strong mandate for India's automotive sector due to numerous inherent advantages. As a strategy, it could help OEMs solve traditional challenges such as near-shore development for the new product introduction (NPI) process, agility, control over supplier quality-cost-delivery (QCD), and optimisation of logistics costs and just-in-time inventory. In recent times, COVID-led global disruptions and geopolitical tensions have reinforced the need for developing strong local supply chains.

In addition, enabling domestic production of EV components is a key pillar of the Government's vision for driving EV penetration in India. A host of regulatory policies have been deployed towards this goal, starting with the Make in India policy in 2014 and assuming more definitive shape in recent years through the phased manufacturing plan (PMP) for claiming FAME II incentives, besides the Production Linked Incentive (PLI) scheme for the automotive sector and advanced chemistry cell (ACC) and electronic manufacturing.

Despite these efforts, the EV supply chain has not been able to localise at a rapid pace. While OEMs have been driving tier-1 localisation through limited local value addition on some components, true tier-2/3 localisation has yet to be achieved. To understand this, it is important to acknowledge that the localisation of EVs has been particularly challenging due to the nature of components/assemblies and the available ecosystem in India. A typical bill of material (BoM) of an internal combustion engine (ICE) vehicle is significantly different from that of an EV.

Previously non-existent components such as batteries with advanced chemistry, electric motors, power electronics and software now make up at least 50–60% of an EV as per our estimates. Most of this component ecosystem is not present in India, thus necessitating a focus on the key dimensions of tier-1 manufacturing presence, intellectual property (IP) and local workforce skillsets for any local development. Besides, the need for rare earth raw materials and high content of electronic child parts further challenges the local value addition potential.

The regulatory push has most definitely helped initiate the journey towards EV localisation, especially with electric two-wheeler and three-wheeler manufacturers focusing on localisation to claim FAME II benefits. However, there are multiple questions from industry stakeholders: What happens when incentives run out? Would FAME II be extended? Would it have more stringent PMP requirements given that the Government is investing heavily in PLIs? Is tier-1 localisation enough? How would significant value addition move to India?

We feel some of these questions will become less relevant as EV penetration reaches a critical mass and significant spend is locked in these components. This is when OEMs will get an organic pull from localisation measures.

Current EV localisation dynamics in India: Emergence of green shoots

Critical EV aggregates have faced challenges due to lack of ecosystem readiness for local value addition. Local manufacturing capacities, upcoming start-ups and local innovation are driving opportunities for growth and investment in localisation potential. Consequently, it is important to continue to monitor these aggregates and their development.

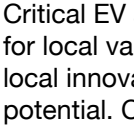
Battery cells and packs:

As per PwC estimates, the battery accounts for a significant 30–40% of the vehicle BoM cost, with roughly 18–22% of this cost locked in battery cell raw materials (largely rare earth). This is a significant value that is completely determined by reserves of raw materials and lies beyond the scope of localisation. Battery cells – currently imported from large cell manufacturers – make up roughly 70–80% of the battery cost as per PwC estimates.

NITI Aayog estimates 100–260GwH of Li-cell demand in India by 2030. The Government's PLI scheme aims to build 50 GWh of manufacturing capacity with 60% value addition over a period of 5 years through the PLI scheme. The pace at which this capacity grows will be slow due to the high investments required and the complexities involved in cell manufacturing.

In addition, there is an ongoing debate on the type of battery chemistry that will take off in India, especially as OEMs balance performance and energy density requirements with the country's warm climate and recent steep increases in the prices of raw materials. While the same chemistry may be produced on the manufacturing lines in different batches if the cell dimensions are not altered, significant technology know-how and shift of focus is needed across the cell types.

Given this context, we estimate a significant gap in demand-supply even after PLI-led manufacturing comes into play, with continued imports of cells required over the long term. In addition, OEMs have been investing heavily in blocking capacity at global cell manufacturers and would like to realise the full benefits of these investments before moving to local sources.



Planning for and securing local battery cell manufacturing supply by collaborating with the ongoing investments in the space will be critical. At the same time, continuous proving of local emerging suppliers of child components such as TIMs, high-voltage connectors and bus bars will drive incremental local value addition in battery systems.

Electrical and electronics (E/E) components and software:

As per PwC estimates, EV-related E/E components account for 15–20% of the vehicle BoM cost, including electric motors, power electronics, EV electrical architecture and higher infotainment content.

The powertrain is based on the electric motor and its contribution to the BoM varies significantly based on the underlying technology. Given the emerging EV play in two-wheelers and three-wheelers, most of the tier-1 play in India is focused on brushless DC (BLDC) motors, with a host of start-ups emerging in the space besides investments from large tier-1 companies. However, most of the locally manufactured motors are currently relying on Chinese imports for child parts to ensure commercial viability, with limited local value addition in BLDC motors. While rare earth magnets will have to be imported from China, some other components such as laminated stators are also mainly Chinese imports. Beyond BLDC motors, any high-value plays such as PMSM motors and e-axles are still mostly under development in the local ecosystem.

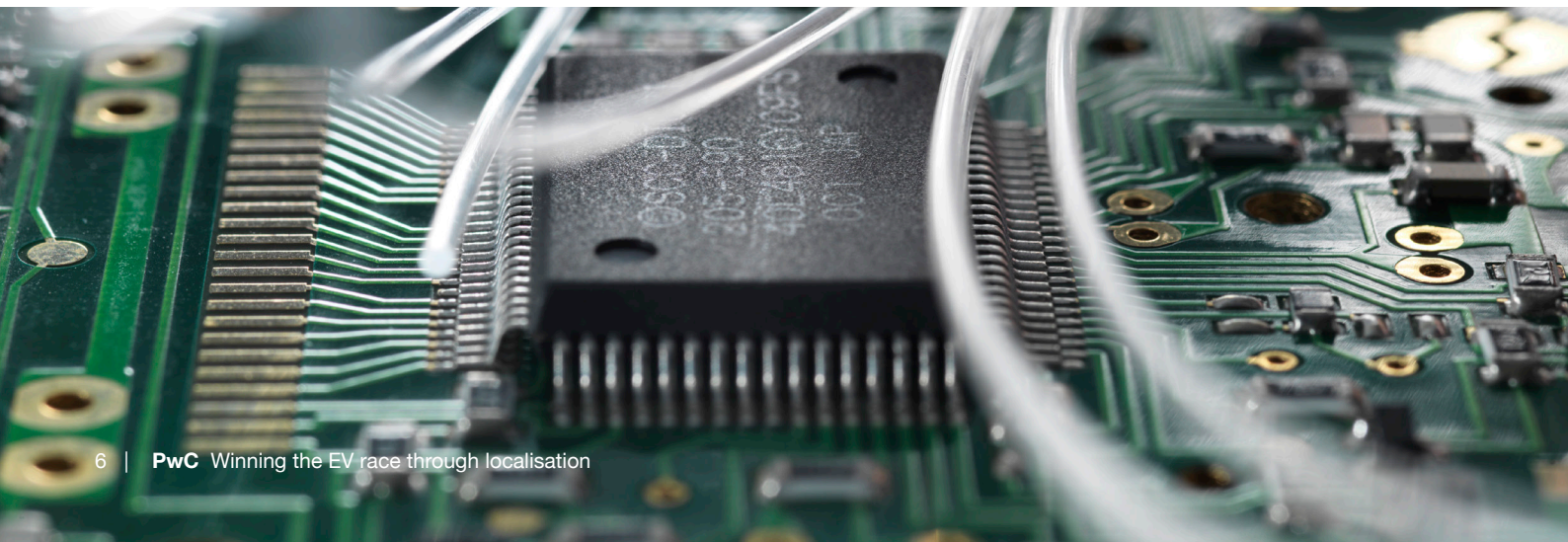
Electrical content has increased significantly – high-voltage power electronics account for at least 6–10% of an EV's BOM cost as per PwC estimates. Components such as connectors, contactors, relays and DC-DC convertors are important parts of an EV high-voltage circuit. However, there are currently very limited local options available for these components, with China and Taiwan controlling most of the global supplies. This is primarily due to the investment-intensive nature of these components.

In addition, a significant chunk of high-voltage power electronics comprise proprietary components – BMS, motor control units (MCUs) and VCUs, etc. However, these systems have significant dependence on sub-components that are not manufactured in India: IC (semiconductor chips), electronic child parts, TIMs, printed circuit boards (PCBs), etc. Besides, the capability of Indian OEMs to design these complex E/E systems is currently limited and is developing. In addition, the requirements for controller area network (CAN) integration and testing are still heavily dependent on China.

Software content has also significantly grown in EVs to monitor performance, run thermal runaway simulations, programme complex sinusoidal waveforms for motors, drive over-the-air updates (OTAs), etc. While this does not feature as a separate line item in vehicle BoMs, significant value is locked in black box assembly – which is difficult to localise without the support of tier-1 manufacturers or in-house capabilities. In terms of localisation, testing and flashing of software is increasingly being done in India to drive local value addition. However, this local operation is rarely one of the decision-making factors for selecting suppliers and is often conceptualised with suppliers during the course of supplies for driving incremental local content. In parallel, OEMs are pushing for the development of in-house capabilities on software to control performance and regular updates, especially to build the IP on these critical elements.

In electric motors, local manufacturing of most of the currently imported child parts such as laminated stators is highly feasible (except hall sensors and neodymium material) and is already happening in India. Similarly in high-voltage power electronics, global manufacturers of critical components (e.g. connectors, contactors), large system assemblers (for BMS, MCU, VCU, etc.) and surface mount technology (SMT) lines are also now coming up in India.

Partnering with emerging start-ups (especially in motors) and tier-1s investing in India, coupled with cross-OEM collaborations to standardise child parts, can help establish commercial viability for local value addition.



The path ahead

Given the changing dynamics of the EV industry, we believe industry participants can focus on:

- running specialised project management offices with cross-functional teams to drive increased localisation
- embedding teardowns and benchmarking to ensure design for local
- relooking at internal capabilities towards driving readiness for localisation, especially software and power electronics
- putting together task forces to track emerging suppliers and their offerings
- establishing control towers to monitor critical components (semiconductors, rare earth raw materials) to keep import costs in check
- exploring collaboration with the existing supply base/ emerging local players to accrue the critical mass needed for higher RoI.

The views expressed in this article are those of PwC's Management Consulting team for the automotive sector and are based on their experience of helping automotive clients in their pursuit of EV localisation.

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