Azadi Ka Amrit Mahotsav

FICCI

India@2047:
Electric Mobility





Knowledge Partner

YES BANK

Title | Year	India@2047 - Electric Mobility | June 2023
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Background

About FICCI EV Committee

The Electric Vehicle (EV) Committee of Federation of Indian Chambers of Commerce and Industry (FICCI) has been constituted with an aim to promote manufacturing and R&D of electric and other zero emission vehicle technologies in the country and to look at the development of ecosystem for these technologies. The committee looks at the sector in a holistic manner by having representation from Auto sector, Components, Power and Energy sector, Cab operator and Academia. The committee aims to enhance the efficiency, technology and global positioning of the Indian Automotive sector on the world map of green mobility.

The committee discusses policies with the various stakeholders & industry experts for recommending appropriate measures to promote green mobility. Government of India is also promoting green mobility initiatives in a major way through policies/schemes like FAME, PLI etc. coupled with initiatives of State governments and the committee is working closely with the Government to further the cause of the sector..

Objective of the Study

India is at an inflection point as the country completes 75 years of Independence and looks forward to the next 25 years. At this juncture, FICCI aims to propose a set of actions to achieve India's full potential in E-mobility.

This report sets out priorities and actions for companies in the automotive sector and suggests where and how state and central governments could help enable and accelerate progress. Through the report, FICCI will hopefully inspire and motivate companies, both big and small, start-ups and established leaders to drive actions that could achieve the country's potential to deliver millions of jobs and ensure sustainable and inclusive growth.

This study has been undertaken with the below objective:

- Capture India's Electric Mobility (xEV) sector's potential till 2047
- Identify challenges and opportunities for the Electric Mobility (xEV) sector
- Create a framework of solutions as an accelerated road-map to achieve the Electric Mobility (xEV) sector potential. This is categorized into immediate/short, medium term and long term so as to prioritize action points from a company, industry and policy perspective.

Methodology

Intensive stakeholder consultation was undertaken to achieve the objectives of this study. Focused interviews was conducted with members of the FICCI EV Committee, stakeholders in automotive ecosystem including automotive component industry, battery manufacturers, Electric Vehicle Supply Equipment manufacturers, Charge Point Operators, Hydrogen ecosystem, policy makers at the central and state level, among others. Studies focusing on industry trends have also been considered and are mentioned in the reference section.



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1 INDIA'S E-MOBILITY ASPIRATIONS

India@2047: E-Mobility Aspirations

in numbers

Market development	**87% xEV Penetration** In New Vehicle sales by **2047**	**90%** of 2Ws; **91%** of 3W; **79%** of PVs; **67%** of Buses
Supply Chain; Tech.	**1 Cr Jobs** Across the xEV value chain by **2030**	**>85% Domestic Value Chain** Manufactured in India by **2047**
Sustainability	Up to **160 $MtCO_2$ emission reduction** in **2047** (Tail pipe emissions) Up to **1,500 MtCo2 cumulative reduction in emissions** over 2023-47	**~40% reduction in crude oil consumption** by automobiles in **2047**

Note: Reduction due to xEV penetration in vehicle stock on road for the vehicle categories described above, which are otherwise considered to be diesel/petrol driven

Source: CEEW[32,33]; RMI-Niti Aayog2; Niti Aayog-MoP-WRI[34]; TERI36; McKinsey[35]; EIA31; Ministry of Skill Development and Entrepreneurship[27]; IEA[30,37]; YES BANK Analysis



2 TAILWINDS & CHALLENGES

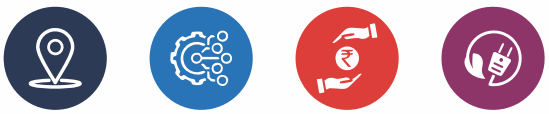
Several Opportunities provide impetus across both market and supply chain development...

Market Potential & Global Opportunity	Push for Adoption & Safety / Reliability	Cost Alleviation	Charging
• Indian market of >20 mn vehicles sold annually; Growing number of launches • Global xEV shift; more level playing field; India's 2/3W global leadership • Indigenous resources for value chain segments	• CAFE, RDE, BS6.2 norms • Govt. demand aggregation • Green Goals: COP26/27 and Corporate commitment • Enhanced focus on safety standards	• TCO effective for shared mobility • FAME, GST, state cess waiver, tax & insurance breaks • Fintech startups in xEVs	• Regulatory ease - battery-swapping, charging service & charging location readiness • Increasing affordability of chargers

MARKET



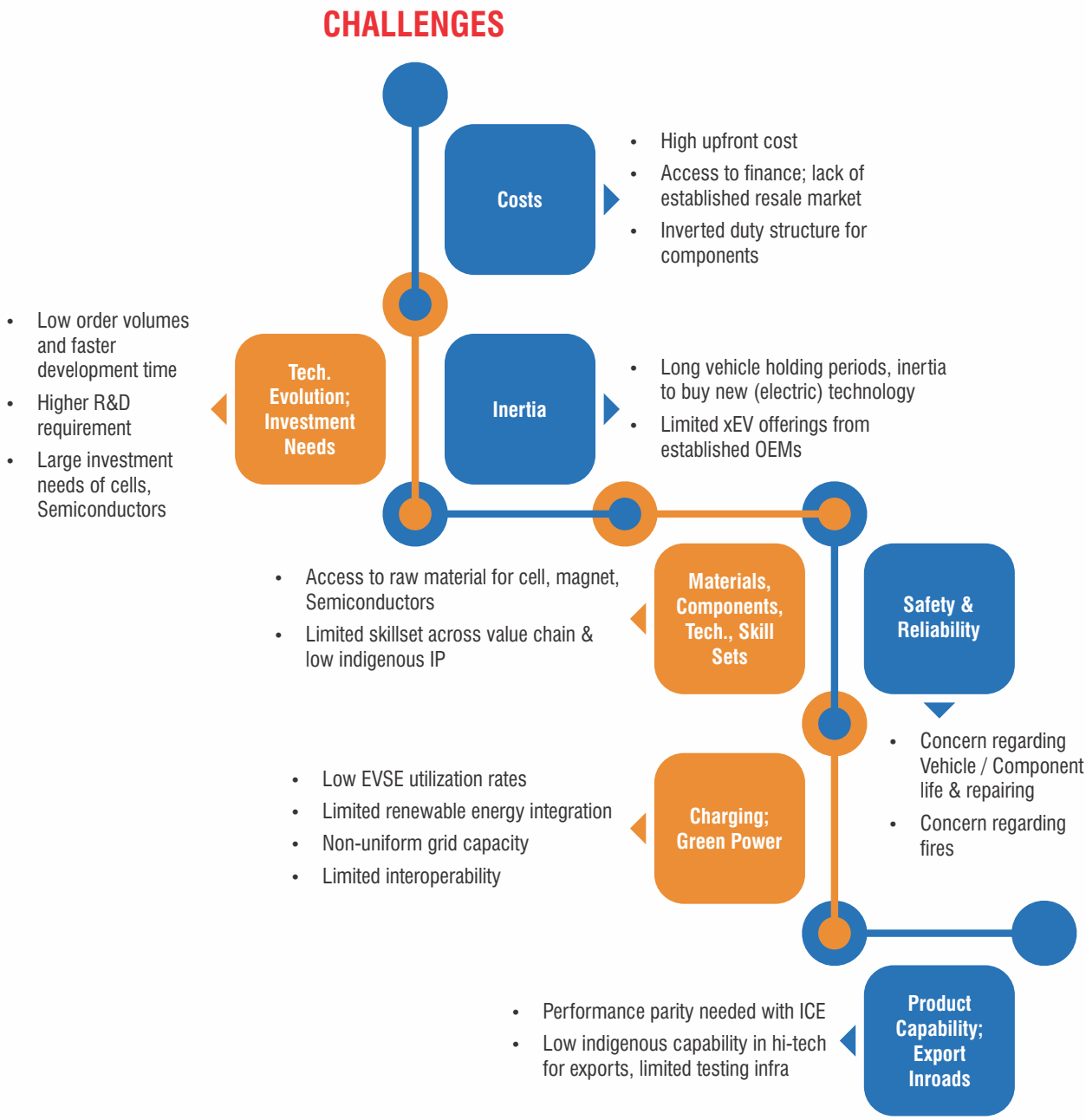
Tailwinds supporting the sector



SUPPLY CHAIN

Indigenous Technology; Local Material/ Component Development	Technology Access	Investment Support	Green Power
• Needs of Indian drive cycle, cost sensitivity • Value Chain localization push incl. FAME, PLI| R&D programs • Local material - Emerging tech. (Hydrogen, Metal air, Carbon); battery recycling	• Global technology access in 'CASE' paradigm • Domestic startups across value chain • Govt. efforts for R&D ecosystem (Startup India, AIM, TBI) incl. synergies between bodies	• Growing Interest from PE/VC firms • PLIs supporting large domestic investments across value chain	• Greening of the grid & auto value chain

...while challenges remain to be solved for



Challenges and opportunities in Electric Mobility (1/3)

Market Development (1/2)

Opportunities/Tailwinds		Key challenges/What is needed	
Market Potential	• Large *addressable market* of >20 mn vehicles sold annually in India[13] • Growing number of *launches and models incl.* from incumbents	***Capability***	• Limited applicability across segments (trailers, MHCVs, etc.) due to lower *energy density* • *Performance parity* concerns with ICE vehicles
Gloabal Opportunity	• *Global shift to xEVs* (>70% 4W sales penetration by 2040 i.e. 72 mn vehicle sales; 60% in CVs, 30% in MHCVs, 80% + in buses and 2/3 wheelers – leading to $53 trillion opportunity by 2050)[14] • Global leading position in 2/3W and Vehicle development for India's climatic & drive conditions, can open up 2W & 3W markets in tropical & emerging nations • xEVs being more technology driven, present a more level playing field for emerging technologies/ processes (Hydrogen, Sodium, Metal Air, Carbon based, etc.) may allow International market share development and *better value addition* • Good *Indigenous Resources* of steel, copper, electrolyte, carbon which are used in various segments of the xEV value chain, can be used to develop capabilities and participate in global value chains	***Exports***	• *<2% share* of global auto & auto component trade[11] • Low indigenous capability in xEV components (only 14% exports are electrical/electronic parts)[12] • Limited know-how in aftermarket and cell chemistries/ power electronics/ sensors • Limited *Testing infrastructure* for conformity to global standards

Greater Relevance for: Vehicle OEMs Component Players Charging Infrastructure Players

Challenges and opportunities in Electric Mobility (2/3)

Market Development (2/2)

Opportunities/Tailwinds

Push for Adoption

- *Emissions mandates:* 13% reduction in CO_2 emission level kicked-in in FY23 (CAFE-II norms)[24]; increasing ICE emission tightening – RDE and BS6.2 in FY24[25]
- Ongoing Govt. *demand aggregation* of 2.13 lakhs vehicles[8, 15] also giving up to 60% cost reduction[9] in buses, 22% in e3W
- ***Green goals:*** Indian firms' largest[10] xEV corporate fleet & EVSE commitment in EV100; India's COP26 commitment for increasing zero emission vehicle sales reiterated in COP27

Safety/ Reliability

- Enhanced battery safety standards[18,20]; regular review of automotive industry standards

Cost Alleviation

- Cost effective (*TCO* basis) for *Fleet/ shared* mobility market which is forecasted to grow at ~40% CAGR over 2021-25[4]
- Purchase subsidy of 15-20% (FAME II, excluding buses)[28,29]; GST reduced to 5% from 12% & 8% on Battery EV & EVSE; waivers on the 4-21% state cess (road tax, registration)[7]
- ₹1.5 lakh *tax benefits* on xEV loan | 15% lower third party *insurance* costs[6] | Advent of *Fintech* startups to finance xEVs

Charging

- Regulations easing battery-swapping, charging service, xEV charging readiness in new buildings
- Affordability of chargers, especially AC chargers

Key challenges/What is needed

Inertia

- Long vehicle holding periods, inertia to buy new electrified technology
- Limited offerings from established OEMs in xEV portfolio

Safety/ Reliability

- Concerns regarding *fires* | Electronic *malfunctions*
- Vehicle Servicing/ *Repair* | Vehicle/Component *Life*

Costs

- 53%[1] higher component & developmental costs globally prevent TCO parity with ICE
- Lack of after-market impacts resale value & leads to limited/ costly retail *finance* (~2X rates) & with lower LTVs (50-75%)[2]
- Higher *insurance* costs[3] due to limited historic performance data
- *Inverted duty structure* leads to receivables tie-up for component players

Charging

- Low *utilization* rates impact business viability
- Availability, clearances & cost issues for *locations & upstream* power infra.
- Low & non-uniform *grid load* capacity
- Chargers/ battery with limited *interoperability*

Greater Relevance for: Vehicle OEMs | Component Players | Charging Infrastructure Players

Challenges and opportunities in Electric Mobility (3/3)

Supply Chain & Technology

Opportunities/Tailwinds

Material/ Component Access	• *Strengthening localization norms* for demand incentive, PLI[19] • *Emerging technologies/ processes* with low scarce material & high local material dependence (Hydrogen, Sodium, Metal Air, Carbon based, etc.) • Efficient *Battery recycling* can reduce dependence on imports
Indigenous technology	• Different requirements of *Indian drive cycle* & cost competitive Indian market supports local technology development • Increasing Govt./ Industry/ Academia driven *R&D programs*
Technology Access	• *Global Technology* Access to quickly adapt to the 'CASE' paradigm; No. of start-ups creating technology for EVs • Govt. efforts for R&D ecosystem (Startup India, AIM[21], TBI) incl. synergies between bodies (e.g. through National Research Foundation)[22]
Investment Support	• Growing investment Interest: ~$1 bn *PE/VC/ green fund* investment in 2022[17] • Localisation push of the Govt. and *PLI* helping to build (large) domestic capabilities in advanced auto, semiconductor, cells, electronics (4-18% incentive), Capital goods BCD reduction for Li-ion cells[23]
Green Power	• Greening of value chain and grid will significantly reduce the carbon foot-print of auto industry

Key challenges/What is needed

Material/ Component Access	• Limited *raw material access* for cells/ magnets/ semiconductors (globally xEVs require >2X ICs)[26], leading to low *Domestic Value Add*
Skillset/ Indigenous technology	• Limited *skillset* across value chain (cell chemistries/ power electronics, sensors) & production, servicing • Limited indigenous technology/ IPs
Rapid Tech. Evolution	• Multiple *competing technologies* at various stages • Multiple times faster *development time* requirement • Low *order volumes* currently
Investment Requirement	• Significantly higher *R&D requirement* in xEVs compared to ICE vehicles/ components • Battery Cells and semiconductor require *large scale* investment to be economically feasible
Green Power	• Low renewable power in Generation mix (9.9%)[16] • Limited renewable energy integration in xEV industry

Greater Relevance for: Vehicle OEMs Component Players Charging Infrastructure Players



3 SOLUTIONS ROADMAP

Milestones in achieving our aspirations

	Domestic Adoption Gains Prominence	Supply Chain Development	Charging Ecosystem Prevalence
1 - 5 years	e-Scooter, e-cycle, e-Motorcycle eCar (Fleet) e3W: e-rickshaw, e-cart, e-autos e-bus (STU)	Products/processes along value chain leveraging India's **material/ mineral strengths** **LOCALISATION** Mechanical and Power electronics **SECOND LIFE** of Battery application	Installation Across Major Urban Areas Key Rural Areas
5 - 15 years	e-bus (Non-STU) e2W (Greater premium & rural) e-Car (Personal) e-Tractor e-LCV	• Higher **Efficiency** Components; • **Alternate Energy Storage/Source tech.** with lower geostrategic trade risk, local material • **Battery Recycling** **LOCALISATION** Structured localization in Tier 3 & 4 components Magnets Capital equipment Moving from technology adopter to technology developer	**RENEWABLE** energy integration **FLASH** PAN INDIA (incl. rural) **V2V**
15 - 25 years	e-Commercial Vehicles	**Global BRANDS** **ALTERNATE ENERGY Leadership** **Transformation** **Component Players** Modular Tech Providers **OEMs** Integrated mobility / software & service providers Systemic approach to long term R&D	**INDUCTION** **V2X**

Key: Orange font – Potential for India to become a global player in these categories

Key Solutions required for Market Development (1/3)

		Immediate/ Short-Term	Medium-Term	Long-Term
Safety/ Reliability	Company	• Extensive component/material testing & simulation • Define quality standards for components	• Servicing and aftermarket management • Open data on vehicle performance to help create solutions & add trust	
	Industry	• Proliferate longer warranties Including on components • Capacity building for servicing		
	Government	• Regular review of certification standards, to be compliant with threshold quality incl. for value chain • Mandatory registration & Quality test for low speed vehicles	• Value chain visibility & certification • Registration and quality standards for emerging vehicle classes	
Costs (Product + Retail)	Company	• After-market/ buyback deals with finance providers • Utilize green funds for xEV funding	• Create vehicle 2nd hand resale arm • Deepen vehicle aftermarket and battery 2nd life, recycling	• Process/ system efficiencies
	Industry	• Demand aggregation at component level; Focus on tech. with recycling potential • Explore micro-factories/ flexible lines • Vehicle after-market/ buyback (OEMs & financiers) • Telematics driven insurance and finance	• Establish 3 way partnership between Recycling, battery players and OEMs for overall cost reduction • Introducing carbon/pollution tax to decrease ICE-EV price difference	
	Government	• Include xEV retail finance in banks' Priority Sector Lending norms; Create credit line/ credit guarantee pathways for xEV finance • Extend/ continue customer incentive/subsidy till significant penetration is reached and battery prices reduce globally • Uniform GST across value chain (special codes)	• Adoption subsidy to new sub-segments • Lower GST for new energy vehicles	

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

Key Solutions required for Market Development (2/3)

		Immediate/ Short-Term	Medium-Term	Long-Term
Charging Ecosystem Management		• Focus on BaaS & destination charging • Explore revenue sharing models for charging facilities	• B2C Battery swapping; Highway Charging infra., Vehicle to Vehicle Charging • Lane based electric transport for larger format using over-head/ induction for flash charge	• Focus on setting up/ deepening infra. for emerging tech. e.g. hydrogen at select highways • V2X Charging/ Connectivity/ Communication capability
		• Uniform standards for battery swapping, faster charging for fixed battery e2W/e3W, Threshold quality standards for home charging • Explore revenue sharing models for charging facilities		
		• Standards ensuring Interoperability of charging infrastructure • Electricity T&D financial prudence	• T&D utilities to take a leading role in development of charging Infrastructure. • Upgrade local grid load capacity • Proportion of xEV charging slots at all public parkings	
Vehicle Capability		• R&D on higher capability technologies	• Establishing value chain for priority technologies	
		• Development of greater variety of Vehicle Models, premium 2 wheelers, rural, LCV, PV segments at performance parity with ICE counterparts		

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

Key Solutions required for Market Development (3/3)

		Immediate/ Short-Term	Medium-Term	Long-Term
Inertia		• Industry players can themselves adopt xEVs for their staff transportation, services		
		• Scrapping mandate for 2,3 Wheelers • Govt. bodies at state/municipal level can themselves adopt xEVs for staff, services • Mandate phased adoption by various government bodies e.g. ULBs, and organized city logistics/ fleet operators	• Align emission norms with global best • Vehicle taxation linked to emission which can fast track investment for xEV • Scrapping mandate for LCVs	
Exports		• Focus on areas where: ➢ India has volume advantage, such as 2W, Tractor, 3W, LCV, small cars ➢ Products/processes along value chain leveraging India's material/ mineral strengths ➢ There is lower geostrategic risk of imports	• Develop products in line with global requirements, selective M&A for inroads into international markets	• Build global brands
		• Support cross-border collaborations (Corridors/FTAs etc.)	• Align to global emission/ technology standards, including certification labs for same • Structure export incentive scheme for xEVs • Assist Indian startups in showcasing technology at a global stage	

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

Key Solutions required for Supply Chain Development (1/3)

		Immediate/ Short-Term	Medium-Term	Long-Term
Rapid Tech Evolution		• Indigenize technology • Establish interest in emerging tech. via domestic collaborations/ start-up support • Start-ups and MSMEs to start creating solutions & technology for xEV transformation	• R&D investments/ small teams focused on adjacencies and tech. with low import dependency • Brand building/ modular approach for component players/ design stage collaboration with OEMs	• Long term R&D and material level research, in collaboration with research institutes
		• Continue & enhance industry collaboration with Academia, Start-ups, Skill Councils to develop programs/ platforms addressing skilling and technology demands		• Establish component players as modular tech. providers; OEMs as integrated mobility / software & service providers
		• Enhance structures to incentivize R&D • Aggregate for specialized solution development facilities		
Investment Requirement		• Subsidize importing capital equipment for manufacturing select xEV components • Govt. funded prototyping, testing infra, common pilot plants	• PLI for new battery technologies/ inclusion of other emerging vehicle/ component technologies for production incentives	

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

Key Solutions required for Supply Chain Development (2/3)

		Immediate/ Short-Term	Medium-Term	Long-Term
Raw Material/ Component Access		• Build capacity to lower imports in easier to localize areas - DC-DC converters, chargers, invertors, batteries • Invest in battery recycling	• Identify and invest in new segments of value chain (hydrogen, recycling etc.) • Invest in ability to build capital equipment for xEV components and batteries	
		• Secure long term diversified supply contracts for semiconductors/ magnets/ raw materials as an industry group • Collective impetus in developing and deploying new technology Especially those with lower geostrategic risk of imports and development of human capital in the same	• Develop indigenous manufacturing capabilities for identified products at scale	
		• Structured approach to localization from high value high volume to low volume low value (tier 3 & 4) incl. capital equipment • Secure long term diversified supply contracts for minerals/ magnets as a group		

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

Key Solutions required for Supply Chain Development (3/3)

		Immediate/ Short Term	Medium Term	Long Term
Indigenous Technology/ Skill Sets		• Skill development across production and servicing value chain		
		• Continue & enhance industry collaboration with Academia, Start-ups, Skill Councils to develop programs/ platforms addressing skilling and technology demands		
		• Structure capacity building programs to address skill gap around technology, service etc. • Expanded capacity for testing & certification labs • Schemes for start-up support	• Domestic value add norms at tier 2 & 3 level, and other structures to disincentivize selective component imports	• Incentive & localization policy for emerging energy systems
Green Power			• Establish STU - Energy Player - OEM - Charging Infrastructure. player partnerships for integration of renewable energy	
		• Continue to encourage/ ease open access and other enabling measures to utilize renewable energy for EV charging		

Source: Primary Inputs; YES BANK Analysis

Company Industry Government

"How to make it happen" for Electric Mobility

Solutions

Company-level	• Focus on India's strengths, Global outlook
	• Value chain investment & Innovation
	• R&D spend, efficiency improvement, skilling
		• **Policy reforms**
		  • Incentives & Taxation Based on Significant Adoption & Carbon Footprint
		  • Continue regular review of emissions regulations, incentive utilization & restructure accordingly
		  • Design & implementation of R&D schemes aligned to priority areas (incentive/tax rebate)
			• **Market making**
			  • Export market development
			  • Battery recycling; battery 2nd life markets
			  • Charging infrastructure asset monetization

Industry-level	• Collaborate for standards, procurement, demand aggregation
	• Collaborate for charging, financial products, recycling, green power integration
	• Skilling and technology development for priority products/ processes
		• **Skill building and capability**
		  • Focused skill mission for time-bound EV capacity building across skill sets
		  • Collaborative programs for developing and deploying priority technology/ processes and human capital across priority areas of focus
			• **Agency reform**
			  • Expanded certification capacity, registration & testing
			  • Enhance regular industry-involved review of emerging technologies for re-aligning focus

Policy level	• Safety/performance certifications; Address fiscal issues
	• Regulation & policy to drive adoption
	• Support structures for certification, capacity building/R&D, local value-add, export
	• Support grid development, upstream charging and green power integration
		• **Implementation**
		  • Government and industry self adoption & aggregation for fleet & service
		  • Collaboration "Mission Mode" across players, industry & government for priority technology and exports
			• **State action**
			  • State scorecards / ranking based on renewable integration, policy implementation priority for xEV penetration

Source: Primary Inputs; YES BANK Analysis



4 ANNEXURES

Abbreviation (1/2)

$	US Dollar
₹	Indian Rupee
2W	Two wheelers
3W	Three wheelers
4W	Four wheeler
AC	Alternate Current
AIM	Atal Innovation Mission
B2C	Business to Consumer
BaaS	Battery as a Service
BCD	Basics Customs Duty
BS6.2	Bharat Stage 6 Phase 2 emission norms
CAFE	Corporate Average Fuel Efficiency
CAGR	Compound Annual Growth Rate
CASE	Connected, Autonomous, Shared and Electric
Co_2	Carbon di oxide
COP26/27	26th/27th annual summit of Conference of Parties (COP)
Cr	Crore
DC	Direct Current
e2W	Electric two wheeler
e3W	Electric Three wheeler
e4W	Electric Four wheeler
EV100	Group of companies committed to switch their fleets to EV and/or install charging for staff and/or customers
EVSE	Electric Vehicle Supply Equipment
FAME	Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India
Fintech	Financial Technology
FTA	Free Trade Agreement
GHG	Green House Gas
GST	Goods and Services Tax

Abbreviation (2/2)

ICE	Internal Combustion Engine
IP	Intellectual Property
Km	Kilometer
LCV	Light Commercial Vehicle
Li-ion	Lithium Ion
LTV	Loan to Value
M&A	Merger and Acquisition
MHCV	Medium & Heavy Commercial vehicle
mn	Million
$MtCO_2$	Million tonnes of Carbon dioxide
OEM	Original Equipment Manufacturer
PE/VC	Private Equity / Venture Capital
PLI	Production Linked Incentive
PSL	Priority Sector Lending
PV	Passenger Vehicle
R&D	Research & Development
RDE	Real Driving Emissions test
STU	State Transport Undertaking
T&D	Transmission & Distribution
TBI	Technology Business Incubators
TCO	Total Cost of Ownership
ULB	Urban Local Body
V2V	Vehicle to Vehicle
V2X	Vehicle to everything
xEV	Electric Vehicles including battery electric vehicles, strong & plug-in hybrid electric vehicles, fuel cell electric vehicles

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Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI Electrical Vehicle Committee

Electric Vehicle Committee of FICCI has been constituted with an aim to promote manufacturing and R&D of electric and other zero emission vehicle technologies in the country and to look at the development of ecosystem for these technologies. The committee looks at the sector in a holistic manner by having representation from Auto sector, Components, Power and Energy sector, Cab operators and Academia. The committee aims to enhance the efficiency, technology and global positioning of the Indian Automotive sector on the world map of green mobility.

The committee discusses policies with the various stakeholders & industry experts for recommending appropriate measures to promote green mobility. Government of India is also promoting green mobility initiatives in a major way through policies/schemes like FAME, PLI etc. coupled with initiatives of State governments and the committee is working closely with the Government to further the cause of the sector.

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Headquartered in Mumbai, it has a pan-India presence including an IBU at GIFT City, and a Representative Office in Abu Dhabi.

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Corporate Government Advisory (CGA)

YES BANK is deeply committed to India’s transition towards sustainable mobility and development of a robust EV value chain in the country. The Corporate & Government Advisory (CGA) team has been engaging with Central & State Governments and industry players to offer policy, strategic and business advisory services. CGA is working with various State Governments for developing/ reviewing their State EV Policies and investment promotion initiatives for EV-led manufacturing. The group has also supported several STUs, CTUs, Smart Cities and ULBs for deployment of e-buses and creation of charging infrastructure. CGA is also advising various industry players in developing their EV plans, through tailored advisory & market entry services.

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