Key Trends Driving Indian Automotive Industry

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Key Trends – Disruptions Shaping the Future of Automotive Industry

Emissions

Alternate Fuels

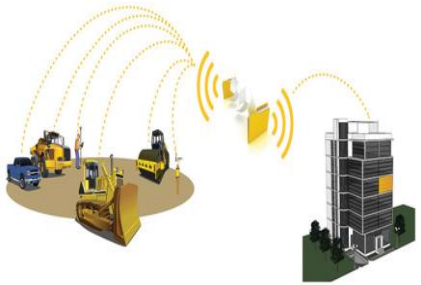
New Business Models

Energy-as-a-Service

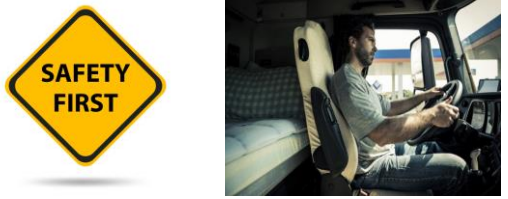
Vehicle-as-a-Service

Pay/Km

Connected Technologies



Driver Safety & Comfort



Customisations

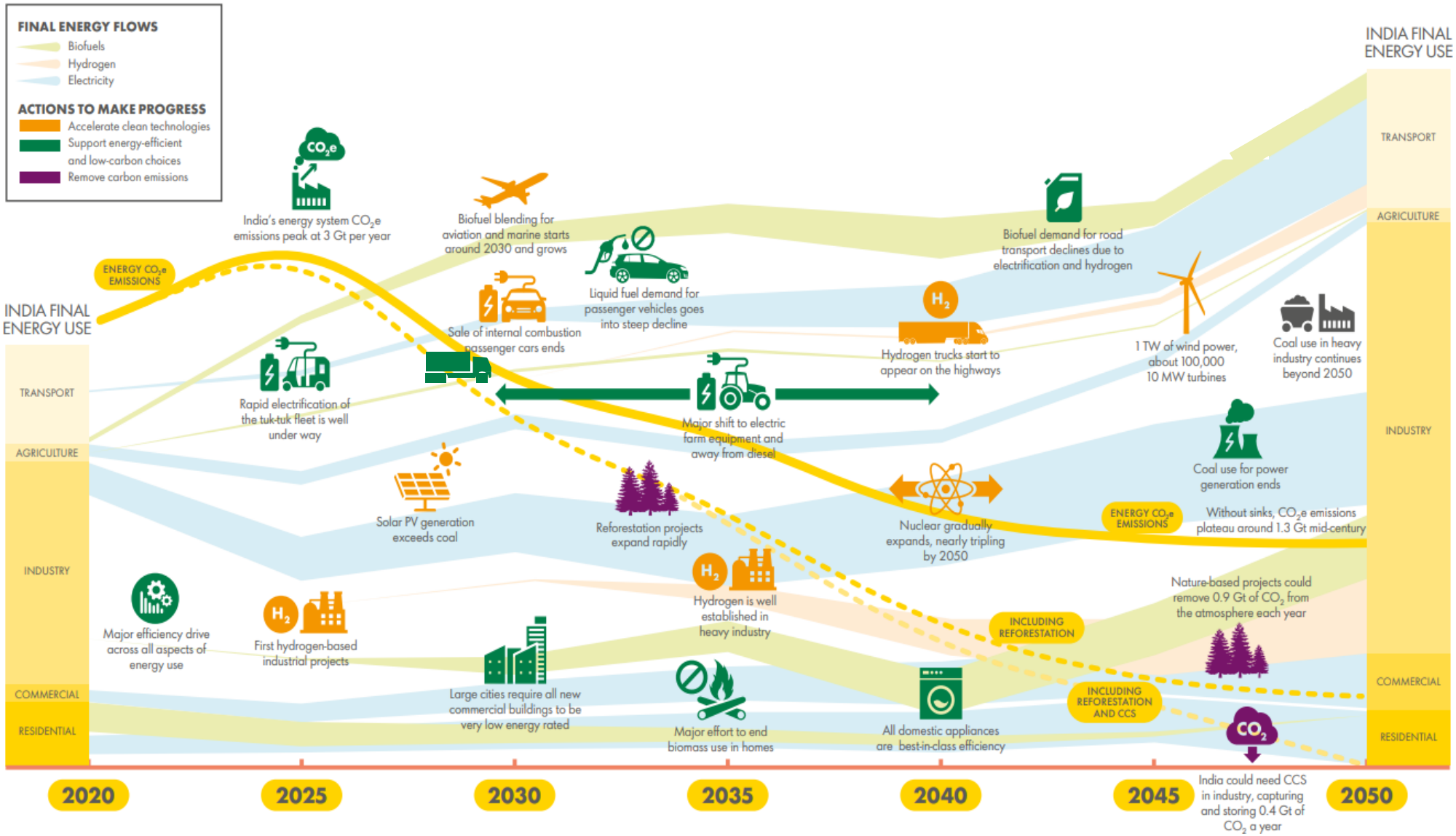
Used Vehicle

Shifting focus to TCO

Circular Economy

The Push Towards Green Energy Economy & Mobility – The Macro Perspectives

Stringent Future Emission Regulations (On-Road & Off-Road), Paris Accord, COP-26, Ever Rising Fossil Fuel Prices



- India's transport sector contributes to ~10% of its GHG emissions.
- Stringent Upcoming Regulations Like RDE, CAFÉ-2 between 2022-2024, Potential EU-7 or BS-VII between 2027-2030 will accelerate the needs to shift towards Greener Fuels.
- India will need a four-pronged approach to achieve its transport decarbonization goals
  - **1] Fuel efficiency.**
  - **2] Sustainable fuels**
  - **3] Electric vehicles**
  - **4] Hydrogen mobility**

Source: TERI & Expandus Analysis

Key Factors Driving Transformation

POLICY & REGULATION

- COP26 & ESG Driven
  - Emissions
  - CAFÉ Norms
- State Level Mandates
- PLI, FAME, PMP
- Scrappage Policy
- Safety Norms
- National Hydrogen Mission
- Draft Battery Swapping Policy

EVOLVING & EXPANDING ECOSYSTEM

- New OEMs/Start-ups
- Investments:
  - Future Powertrains
  - Infrastructure
  - Localisation
  - Modular Platforms
- Materials / Light Weighting

DIGITALISATION

- ACES (Autonomous, Connected, Electric, Shared)
- Smart Lean Factories

BUSINESS MODELS

- Energy-as-a-Service
- Vehicle-as-a-Service
- Pay/Km

Key Drivers for Alternate Fuel Adoption

- TCO
- Charging Infrastructure,
- Supporting Supply Chain
- Regulations
- Policy Driven Incentives
- New Business Models
- HY-ICE: Synergies in IC Parts & Technology
- Reliability

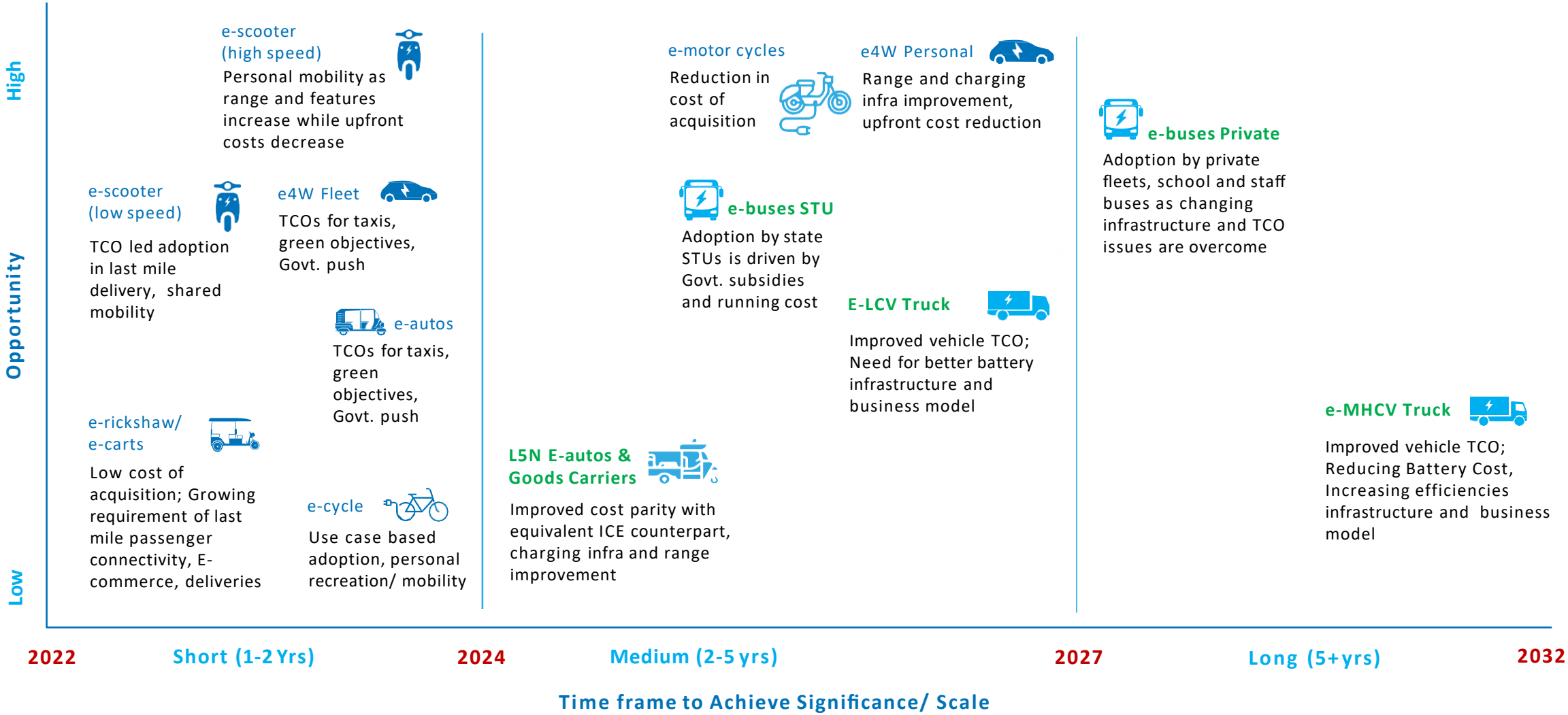
Race of Alternate Powertrains – Likely Adoption By Application

	2W	3W	PC	 SCVs <3.5T	LCVs 3.5T-7.49T	 ILCVs Buses	 ICV Trucks 7.49T-12.0T	 MD Buses	M-HCV Trucks >12.0T
CNG	✗	✓	✓✗	✓	✓	✓	✓	✓	✓✗
LNG	✗	✗	✗	✗	✗	✗	✗	✓	✓
H2-ICE	✗	✗	✓✗	✗	✗	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓	✗
	✗	✗	✓✗	✗	✗	✗	✗	✓	✓

Source: Industry Insights & Expandus Analysis

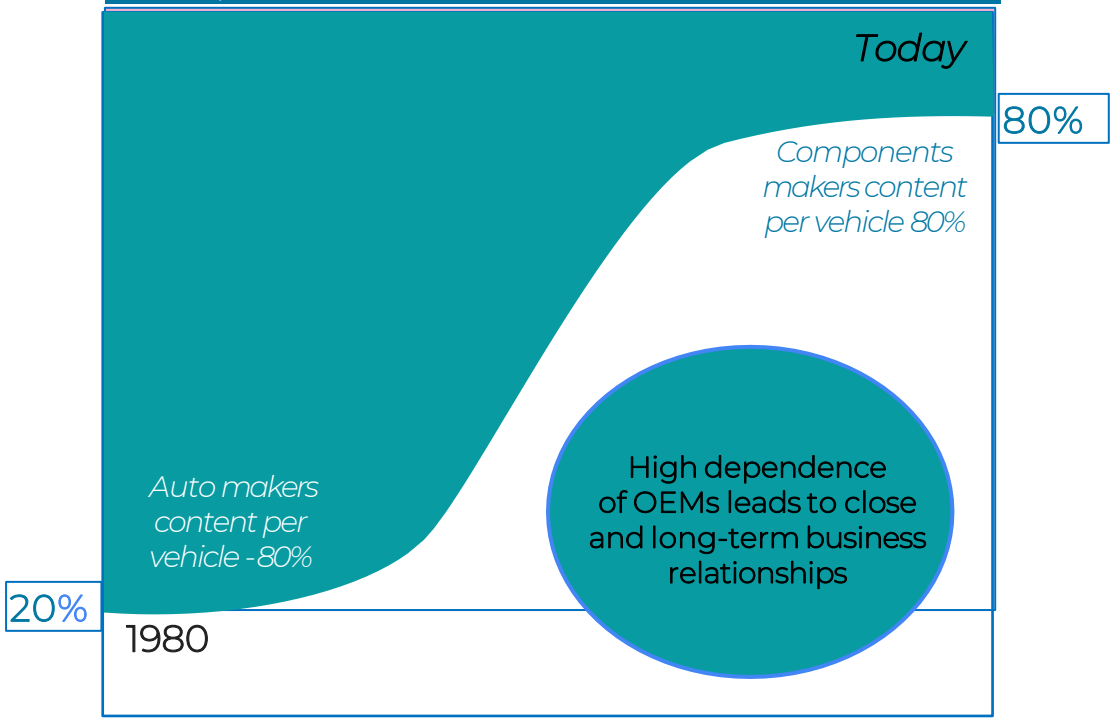
Indian Electric Vehicle Market – Roadmap to Mass Adoption

E-MOBILITY BECOMES A CLEAR DIRECTION FOR MOST OEMs



MAKE vs BUY model : OEMs lean heavily towards BUY

Over the years, automotive OEMs have increasingly outsourced the manufacturing of automotive parts to component makers



What works against theOEMs?

Key Considerations

Longer Time to Market
OEMs take a longer time to develop capabilities, software and technology in-house as it requires a dedicated team followed by a series of pre-market tests to ensure compliance with protocols

Higher Costs
Internally developed components and solutions can cost 10-20x more versus buying an existing solution and can take as long as 2-years to develop, test and launch

Lack of Technical Know-How
OEMs may not have internal access to the expertise required to build a solution in-house. The team must possess the industry specific functional and technical skill sets not only to develop and integrate the software, but also to keep pace with ongoing maintenance & enhancements over the long run

Inadequate scale & expertise to manufacture all components
Roughly, over 10,000 parts go in a vehicle. Automakers don't have the necessary scale and expertise to manufacture all such components. Hence, it becomes essential for them to depend on industry experts who supply such parts and solutions

Evolving & Expanding Automotive Value Chain

High Traction | Mid Traction | Low Traction

SUPPLY

- OEMs
  - Legacy
  - Start-Ups
- Component Suppliers
  - Powertrain & Power Electronics
  - Battery & Associated Components
  - Connectivity & Control Systems
  - Other Components
    - Frame, Axle, Chassis
    - Body Parts
    - Suspension, Braking
    - Tires, Rubber Assembly
    - Interior, HVAC
    - Electrical & Electronics
- Channel Partners
- Raw Material Suppliers

INTERMEDIATORIES

- Fuel Infrastructure
  - Public, Private, Home Charging
  - Battery Swapping
  - CNG, LNG, H2
- Charging Component Suppliers
  - Charger Manufacturers
- Utility / Energy Providers
  - Smart Grid
  - Energy Distribution & Management
  - OMCs/Petrochem Cos
- Vehicle Testing & Certifying
- Financial Institutes
- Telematic/Data Management
- **Software**
- Energy / Mobility As A Service

INFLUENCERS

- Ministry
  - Policies
  - Regulations
  - Incentives
- Industry Associations
  - SIAM, SMEV
  - ACMA, ECMA, FADA etc.
  - IESA, Transport etc.
- Standards, Testing & Certifying Agencies
- Green Tribunals, Environmental Agencies

Customers

- Public / Government
- Fleets
- Institutions, E-Commerce
- Retail (Small/Individual)

Source: Expandus Analysis

Summary

- Global drivers for change include air quality, climate change, electrification, the move to more connected and autonomous vehicles and tightening legislation
- This impacts many industry sectors including passenger cars and commercial vehicles, agricultural, construction, defense and aerospace
- Nevertheless the industry is still continuing to invest in the development of internal combustion engines and transmissions - designing and developing new engines from 3 up to 17 Litres for the CV, Marine and off-highway sectors
- Alternative fuels including LNG, CNG, Hydrogen and Flex Fuel are growing in importance as lower carbon, greener alternatives
- ***E-MOBILITY BECOMES A CLEAR DIRECTION FOR MOST OEMs***
- Component suppliers are playing a huge critical role in this new e-game
- The Evolving Future Market Requirements has offered an opportunity for many new entrants enter/address existing need-gaps in the value chain expanding the supply side