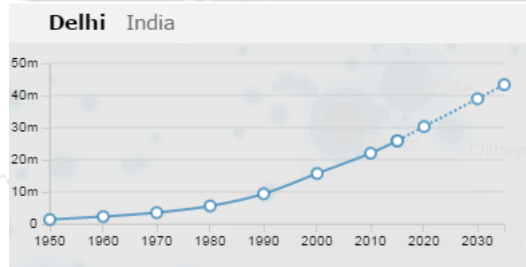
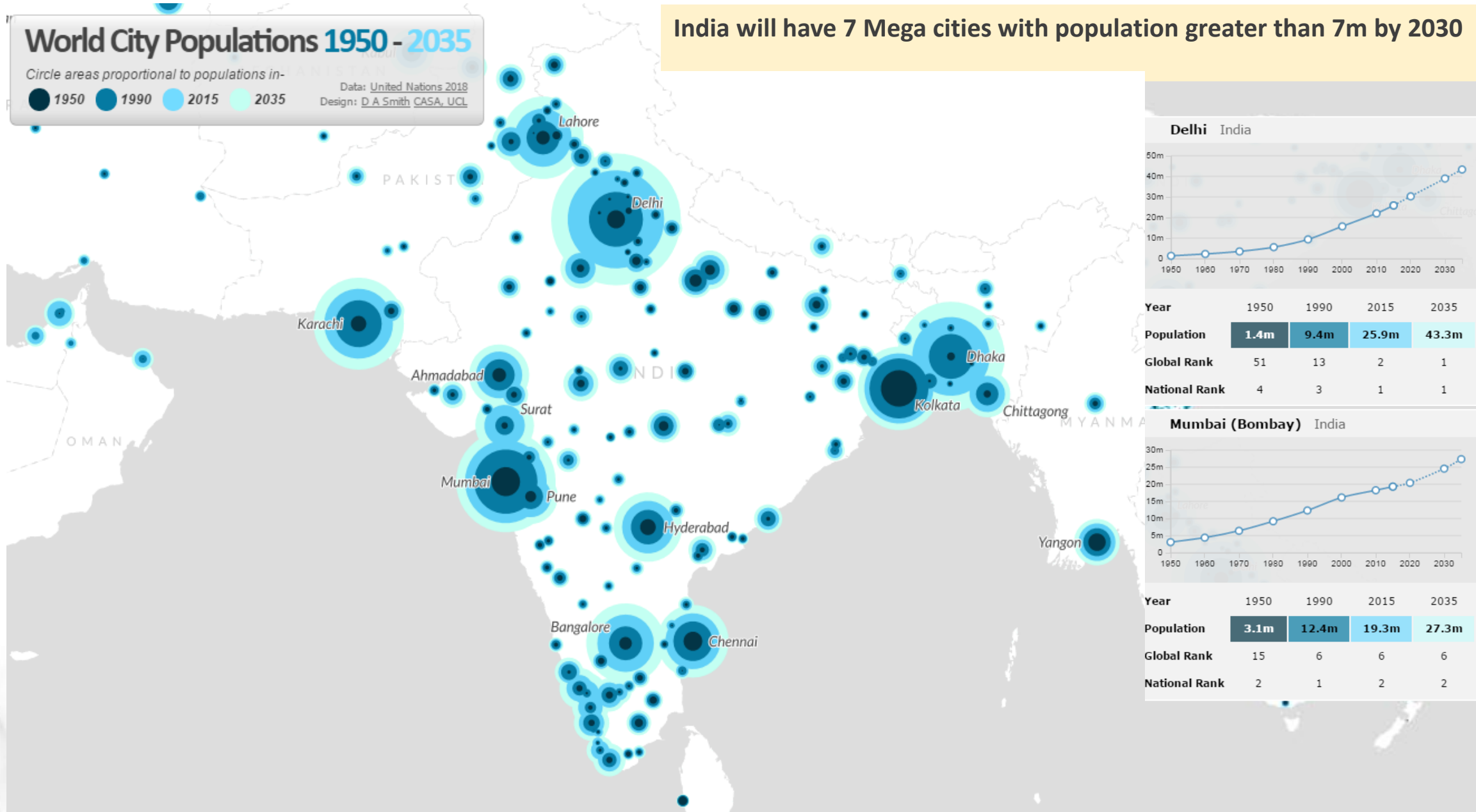
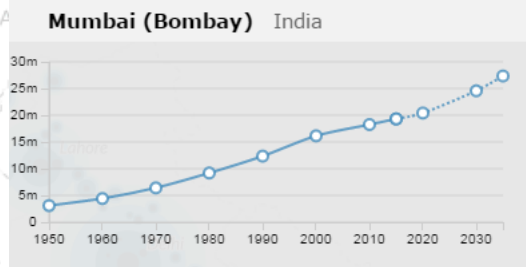


EVs – The India Opportunity

Mahesh Babu, CEO – Mahindra Electric



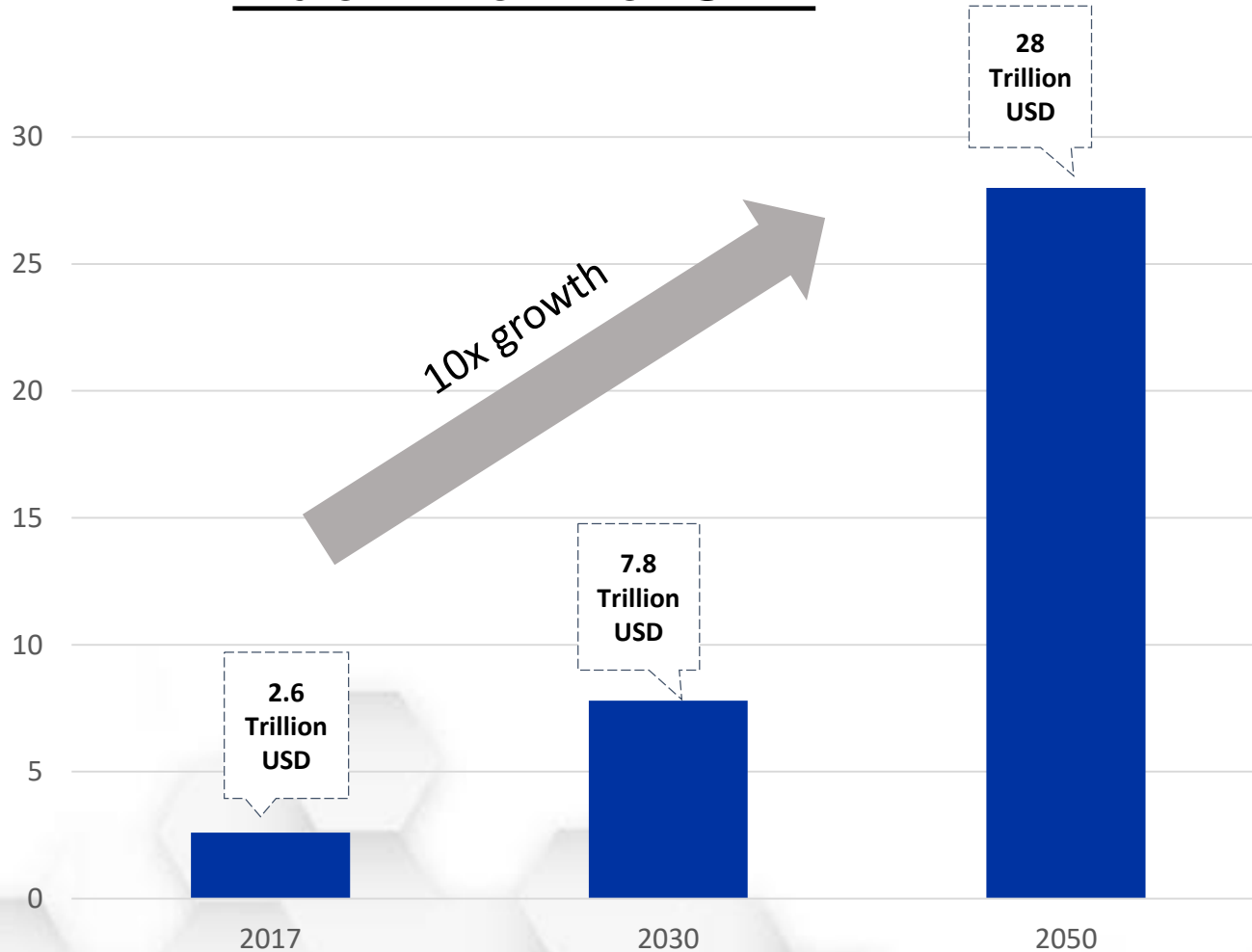
Year	1950	1990	2015	2035
Population	1.4m	9.4m	25.9m	43.3m
Global Rank	51	13	2	1
National Rank	4	3	1	1



Year	1950	1990	2015	2035
Population	3.1m	12.4m	19.3m	27.3m
Global Rank	15	6	6	6
National Rank	2	1	2	2

Factors driving urbanization

India - Nominal GDP



India by the numbers

- India's GDP growth at the rate of **7%**
- India is now the world's 7th largest economy (Nominal GDP terms) – **Will be 3rd largest in 2050**
- **850mn** of the 1.35bn people in India are under the **age of 35**
- Per capita income of around USD 1950 – **Will be USD 13,660 by 2040**

India – A unique market

2 wheelers



- ~80% of all automotive sales in India are two wheelers – **21m in FY19**
- Close to **2m** are involved in courier services – huge market

3 wheelers



- India is one of the largest markets in the world for 3w – **0.7m sales in FY19**
- 3w address one of the most important challenges of urban transportation – Last mile connectivity

Fleet



- Routes are defined and they operate in a limited geography
- Utilization of vehicle is close to **25-30%**

Commercial



- **60%** of the overall goods transportation in the country happens on road – Huge market
- High vehicle utilization in the sector

Personal



Penetration of private passenger cars is still low compared to other developed markets

Mobility needs a reset

'India can be a market leader in electric vehicles'

Experts, however, believe that India will face several challenges regarding infrastructure, clean energy generation and availability of rare earth metals.

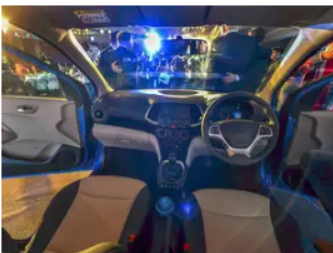
Govt. amends rules to bring in battery-driven vehicles

Incentives offered to taxi operators, especially Ola, Uber

SC issues final deadline for Bharat Stage IV cars, clock begins ticking for India's carmakers

PTI | Updated: Oct 24, 2018, 01:55 PM IST

15 Comments



NEW DELHI: The Supreme Court Wednesday said that no Bharat Stage IV vehicle shall be sold across the country with effect from April 1, 2020.

The Bharat stage emission standards are standards instituted by the government to regulate output of air pollutants from motor vehicles.

The Bharat Stage VI (or BS-VI) emission norm would come into force from April 1, 2020 across the country.

A three judge bench headed by Justice Madan B Lokur made it clear that only BS VI compliant vehicle shall be sold in the country from April 1st, 2020.

The bench said the need of the hour was to move to a cleaner fuel.

Ability to own cars... CHALLENGES AHEAD... SPECIAL CORRESPONDENT

Majority of electric vehicle start-ups who were struggling to find new customers as the government announced tax rebates on electric vehicle loans.

Union Budget 2019 brings cheer to Electric Vehicle Startups

Ministry of Road Transport & Highways Tells States To Incentivise EV Adoption

NITI Aayog Proposes To Convert Two-Wheelers Below 150 cc To Electric By 2025

For electric cars, 2 new charging stations in Lower Parel and Kurla

E-buses may ply early next year; BMTC to lease vehicles

First Agency to Run EV's

Auto Cos Step on Gas to Hit the Road with E-vehicles

Look to bring out e-variants soon as the govt is pushing for an all-electric car fleet by the end of next decade

Ketan.Thakkar@timesgroup.com

Mumbai: Signalling a major change in stance, car makers are advancing plans to electric cars in India by giving them preference over hybrid versions.

The Maharashtra Motor Vehicles Rules, 1989 has been amended to include more incentives to battery-operated vehicles with en-

Driving into Green Zone

Maruti Suzuki developing the EV portfolio, wants to see whether consumers are ready for e-cars

Mahindra has set aside 600 cr for its electric vehicle arm

ALL CHARGED UP How manufacturers - and not just of cars - are gearing up for the massive opportunity that's up for grabs in the electric vehicles space in wake of the govt's big 2030 dream of only electric cars plying in India

CITY TAKES A GREEN STEP Time taken to charge car battery fully. It takes a Mahindra e2o around 7 hours from zero battery to full charge on a slow-charge point. It takes an hour on a fast-charge point.

EXISTING CHARGING STATIONS The first electric charging station was launched in Kurla. Two more came up on Monday, one in Lower Parel and the other in Kurla.

Cash-Strapped Utility Junks Earlier Plan of Buying Buses

M&M to Invest up to ₹4,000 crore to Boost EV Business

Co aims to localise battery making entirely, says MD Pawan Goenka

Co aims to localise battery making entirely, says MD Pawan Goenka

2-Wheelers may 'Electrify' Roads Sooner Than Cars

All major two-wheeler cos in India have scheduled launches of electric vehicles from next year

Sharmista Mukherjee & Ketan Thakkar

New Delhi | Mumbai: Two-wheelers are set to oust four-wheelers in India as manufacturers draw towards all-electric mobility as all top scooter and motorcycle manufacturers have lined up their clean energy products for launching next year.

Some 1,000 electric two-wheelers were sold in India in the past eight years. The potential of electric vehicles in this segment is massive, say industry executives, given that more than 17 million two-wheelers are sold annually globally.

HERO MOTORCYCLE INVESTS ₹205 CRONE IN ELECTRIC TWO-WHEELER START-UP OTHER ENERGY, WORKING ON PROJECTS AT ITS R&D CENTRE

FIRMS' EV PLANS

MARUTI SUZUKI Pawan Suzuki takes up with Toyota to make electric vehicles for India by 2020, also investing in a lithium-ion battery plant in Gujarat

TATA MOTORS Rolls out electric Tigro sedan for a government tender, testing electric buses

M&M First mover, now ready to expand volume and invest in EV batteries; partners Uber & Ola to sell electric cars; ties up with Ford to make e-cars

HYUNDAI Shelves hybrid vehicle plan mid-way, says it will work on electric cars

HERO MOTORCYCLE Invests ₹205 crore in electric two-wheeler start-up Other Energy, working on projects at its R&D centre

Electric shock for automobile makers

Hybrid cars at 43 per cent (including electric buses)

Hybrid cars at 43 per cent (including electric buses)

Hybrid cars at 43 per cent (including electric buses)

Hybrid cars at 43 per cent (including electric buses)

Hybrid cars at 43 per cent (including electric buses)

Hybrid cars at 43 per cent (including electric buses)

India Policy Snapshot

Vision

NITI Aayog's report on Transformative Mobility with BEVs



Auto makers pushed to make EV plans



Ban on fossil fuel-powered 2-, 3-wheelers: Govt plan on track despite automakers' pushback

Automakers say the government's plan to ban fossil fuel two- and three-wheelers in a few years is rushed.

India's switch to electric vehicles will be rapid; 31m EVs by 2040

FAME 1.0 extended to 30th Sep' 2018
FAME 2.0 announced in March' 2019

Policy

Karnataka first released state EV policy



FOLLOWING THE LINE

KARNATAKA , the first state to roll-out an e-vehicle policy to encourage manufacturing	TELANGANA , another state with an automobile manufacturing base, is learnt to be working on a policy	GUJARAT , a prominent state for auto manufacturing, has already attracted investments worth over ₹5,000 crore	HARYANA, MAHARASHTRA and TAMIL NADU have not spelt out electric vehicle policy as of now
---	---	--	---

Few other states have released/drafting EV policy

Custom duty exemption on EV parts
Incentives for local manufacturing of EV parts

Implementation



5% GST for BEVs



Tax exemption for EV owners

Various states running EV bus pilots



- Utilities setting up charging infra.
- NTPC seeks pan India license to setup charging stations



Push To Electric Mobility



Order for **50,000 ELECTRIC** three-wheelers by year-end

Aim is to put **1 MILLION** electric three-wheelers on roads in 18 months

Plans also afoot to bring in 10,000 electric city buses in **15 MONTHS**

EESL has invited global bids for **10,000 e-sedans** and **4,000 charging points**

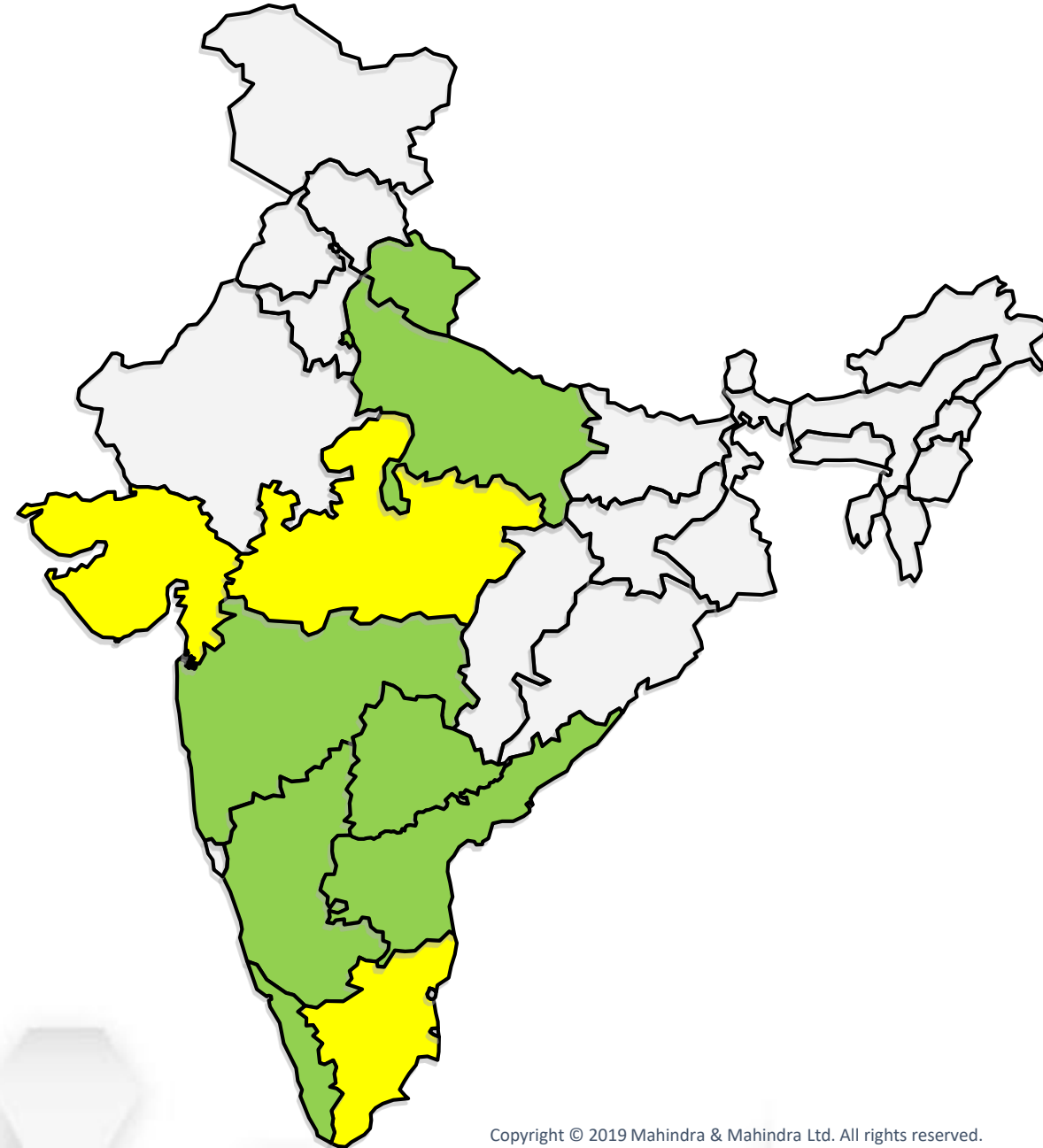
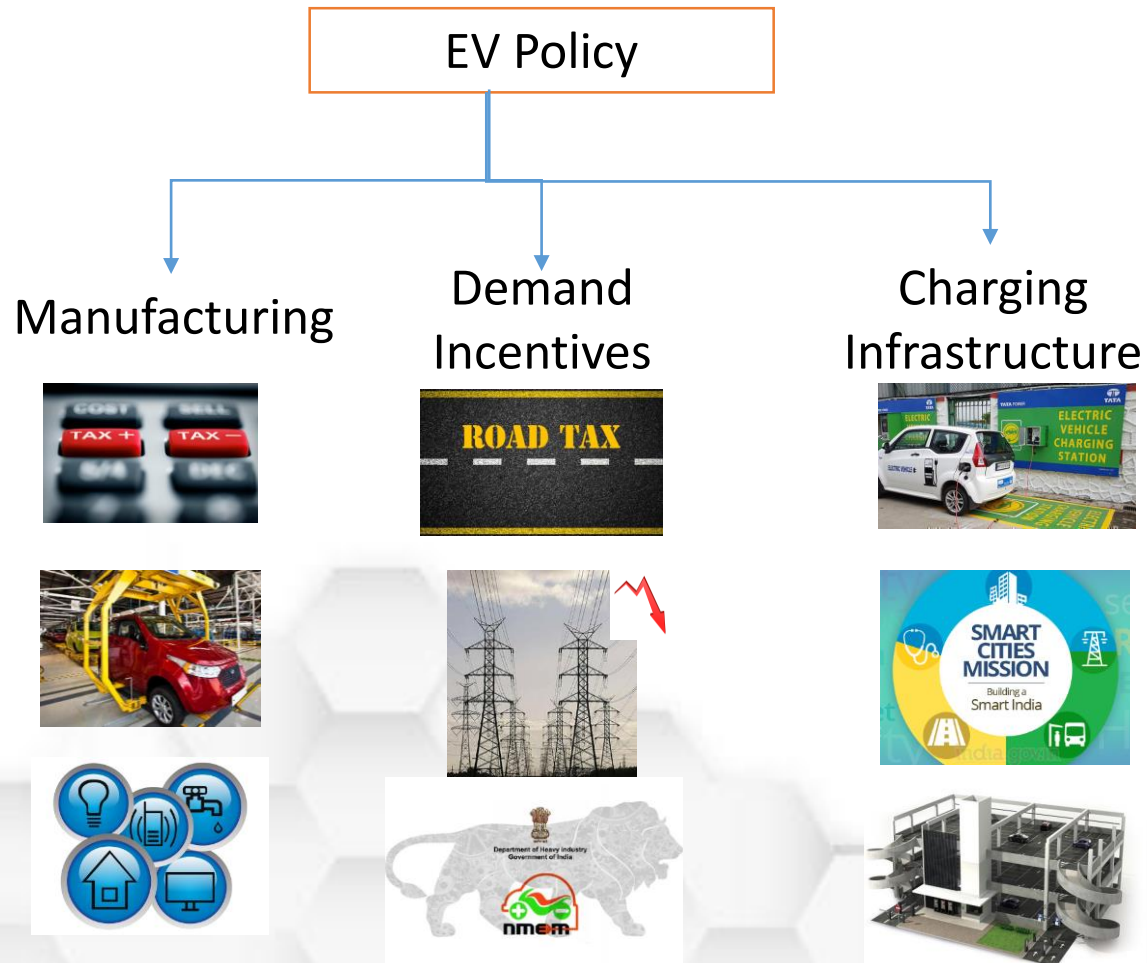
LED-LIKE revolution in e-vehicles market, says EESL's Saurabh Kumar



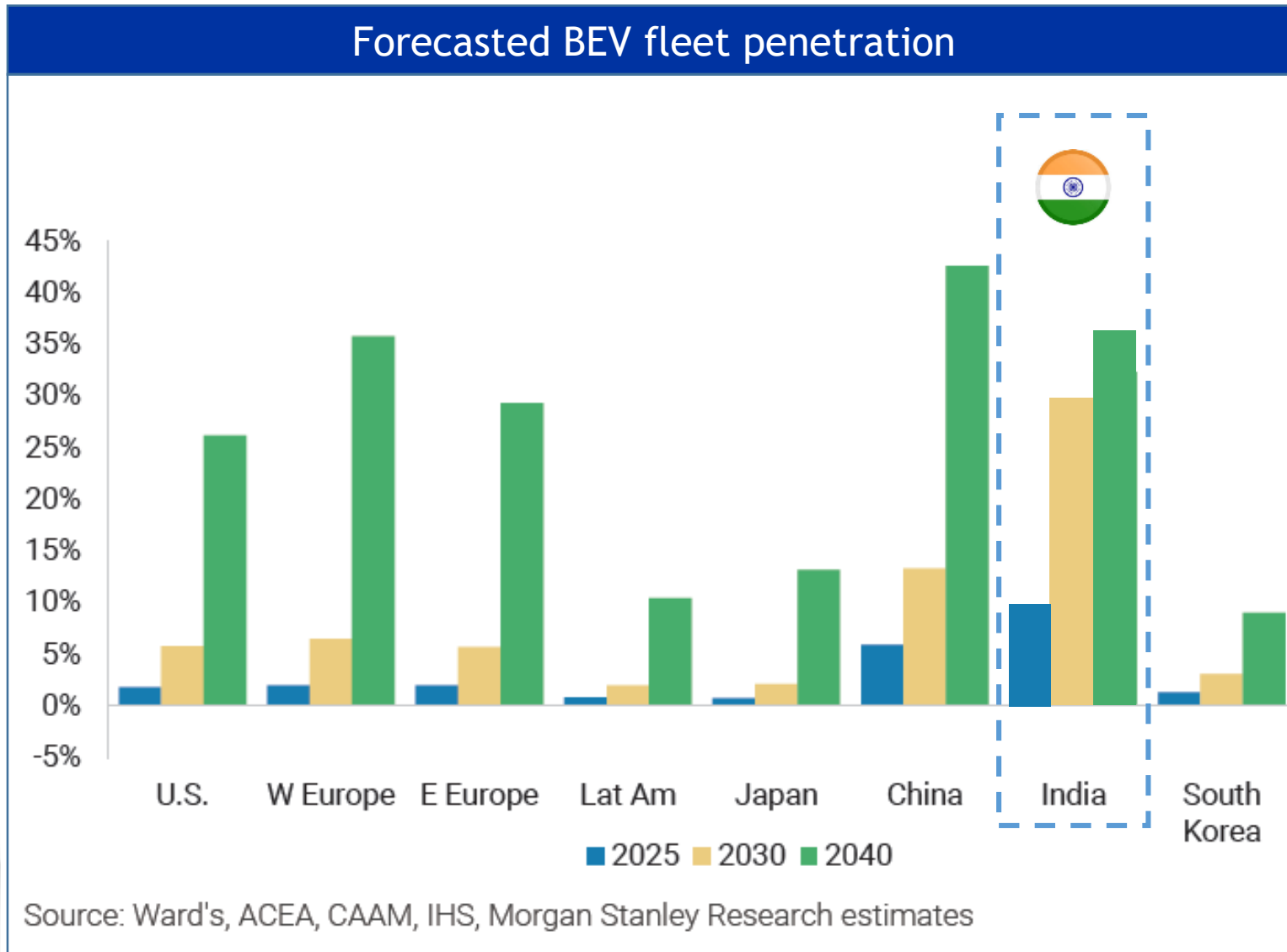
EESL's initiative to create viability through scale

India EV Policy Landscape

- 7 states and 1 UT have released their EV Policies
- 3 states have draft plans ready



Growth paths of global markets



Growth in China

Already largest EV market by volume

Mass vehicle route thro' subsidy
 → Government led – People supported

Growth in Norway

Largest EV market by Market share

Premium vehicle route thro' mix of incentives and fees
 → Government led – People supported

Growth in US

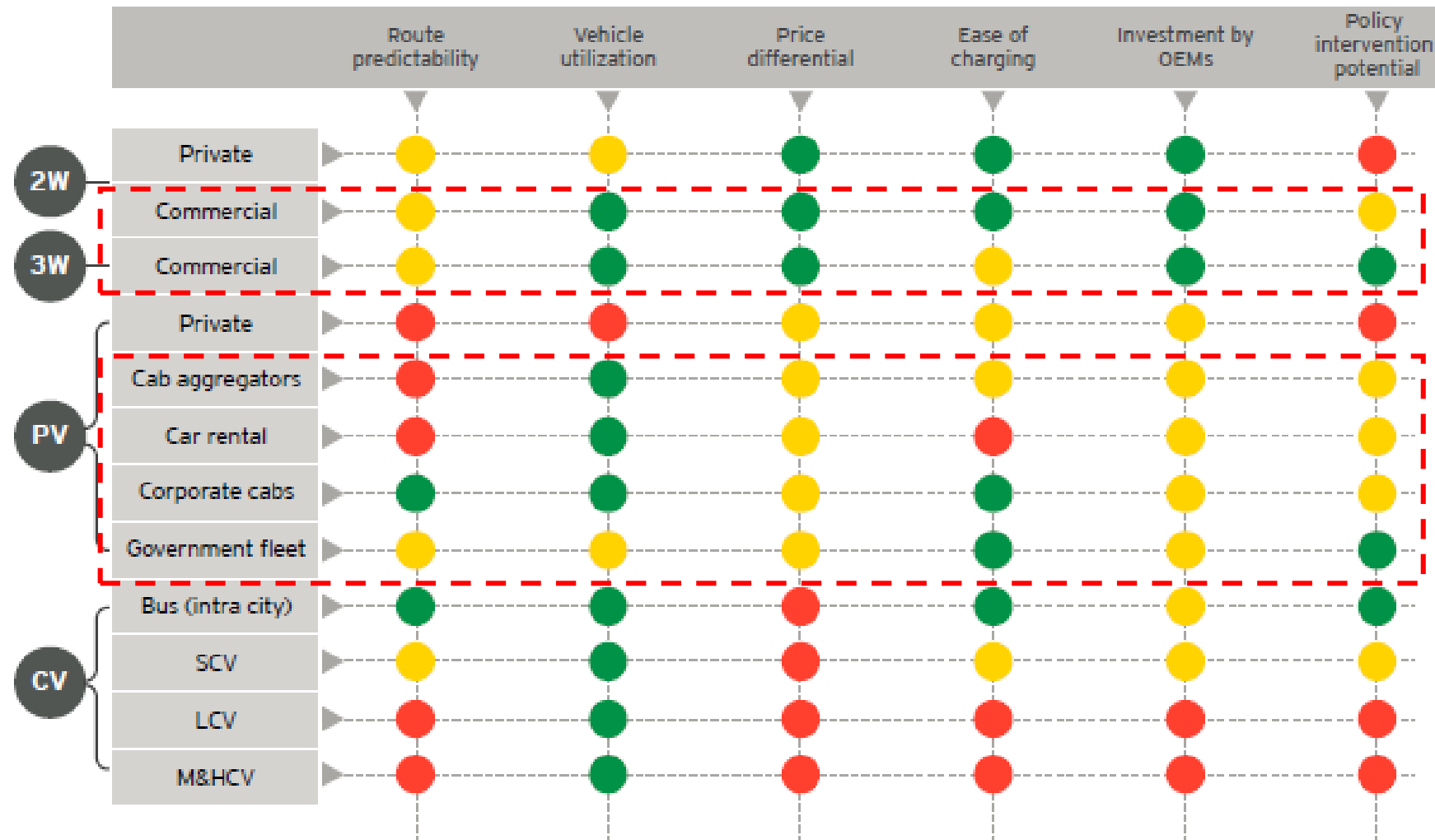
Premium vehicle route

→ People Led – Govt. supported

EV growth in India

Mass vehicle route – with improving total cost of operations of EVs
 (Government led – People supported)

Factors driving electric mobility in India



3W: Three-wheeler; CV: Commercial vehicle; SCV: Small commercial vehicle; LCV: Light commercial vehicle.

● Favorable
 ● Neutral
 ● Unfavorable

Mahindra's Electric journey

1990 2010 2012 2013 2014 2015 2016 2017 2018



1999
Mahindra launches first electric vehicle 8 seater Bijlee



2001
Reva-i launched



2010
Mahindra acquires majority stake in REVA.



2012
Mahindra Reva manufacturing facility inaugurated. IGBC platinum rating



2013
Top 50 innovative companies



2013
e2o launched



2014
Halo Sports car concept showcased



2014
Quick2charge fast charging launched



2015
Only Indian team in Formula E



2015
Successful deployment of Fleet business



2015
Launch of GenZe



2016
4 new launches
- e2o UK
- e-Verito
- e2o Plus
- e-Supro



2017
NITI Aayog Report, vision 2030 announced



Mahindra delivers first cars of EESL tender for 10,000 vehicles



2018
Launch of TREO Auto Showcase - eKUV, eBus MESMA, +NEMO



Announced entry Into EV supercars



Inaugurated Facility expansion

Current R&D Capaility

CAPABILITY

R&D talent pool

300+

Engineers

80+

Researchers

10+

Scientists
(PhDs)

Patent Activity

13

Patents
granted

52

Ongoing
patents

>150

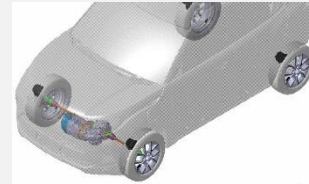
Target for
FY 20 for
patents

KEY ACHIEVEMENTS



DESIGNED FOR INDIAN MANUFACTURING AND ENVIRONMENT

- High strength steel space frame



COST EFFECTIVE DRIVE TRAINS

- 7 patent applications
- Hill hold and Regenerative braking

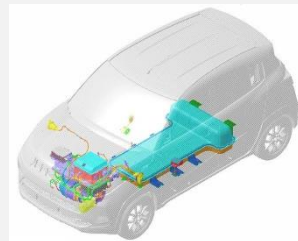


EXTENSIVE USE OF PLASTICS & COMPOSITES

- High impact ABS Plastic Sheets
- No painting and reduces investment in production

IN-HOUSE EXPERTISE ON LI-ION BATTERY PACK & BATTERY MANAGEMENT SYSTEM (BMS) DEVELOPMENT

- 22 patents on battery and BMS technologies
- Platform can support multiple batteries & capacities¹¹



Leading the way in shared mobility

LITHIUM- CORPORATE EMPLOYEE COMMUTING



OLA – PARTNERSHIP FOR SHARED MOBILITY IN NAGPUR



ZOOMCAR LAUNCHED IN MYSORE AND HYDERABAD



UBER AND M&M PARTNERSHIP ANNOUNCED



EESL TENDER DELIVERY IN PROGRESS, PHASE 1 COMPLETED



HRTC – CLEAN PUBLIC TRANSPORTATION



BAGHIRATHI ORDER RECEIVED IN BANGALORE



LAST MILE – MOU WITH TWU AND SMARTE FOR TREQ





Our electric powertrain enabled cars have run more than **135 million electric kms** and counting

REAL ON ROAD EXPERIENCE



6000+
vehicles
on road



90+
cities in
India

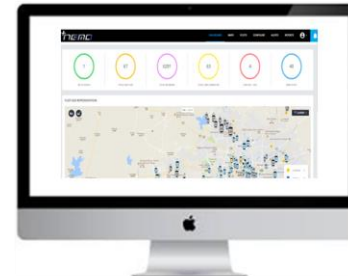


Across
private and
commercial
segments

Mobility solutions



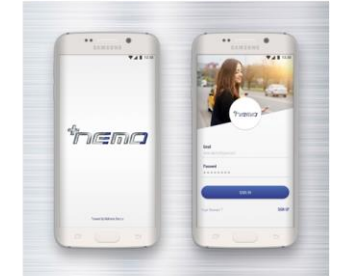
NEMO, which stands for "Next-Gen Mobility", is an e-mobility platform based on the cloud that enables a new generation of Electric, Connected and Shared mobility services



**NEMO Mobility Platform
(Fleet Operations)**



**NEMO Driver App
(Employee Transportation)**



**NEMO Passenger App
(Employee Transportation)**

Integrated sustainable mobility solutions (eg: Auroville community)

Vehicle deployment

Offer our portfolio of EVs as suitable for the application



Enable mobility models

Aims at enabling mobility models such as ride sharing, ride hailing and self-drive through *theMO*



Enable eco-system

Work closely with partners in creating eco-system (parking, charging infra) and integrate on mobility platform *theMO*



Energy storage

Support in End to End clean and green solutions – Mobility to Complete sustainable living



Partners:



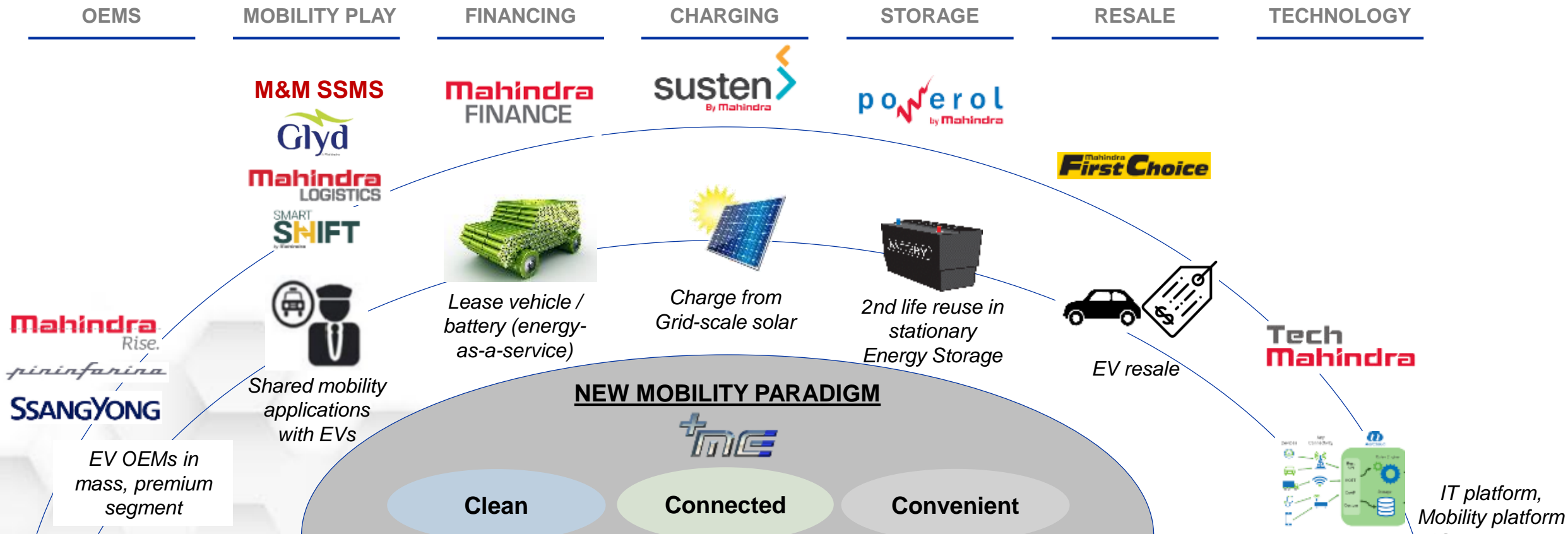
Indian Institute of Science, Bangalore



Puducherry Smart City Development Ltd. (PSCDL)

Future of Mobility

THE NEW MOBILITY PARADIGM WOULD PRESENT OPPORTUNITIES FOR EXPLORING PARTNERSHIPS AND BUILDING ECOSYSTEMS WITH SYNERGIES ACROSS THE MAHINDRA GROUP



Thank you