

CENTRE FOR SCIENCE AND ENVIRONMENT

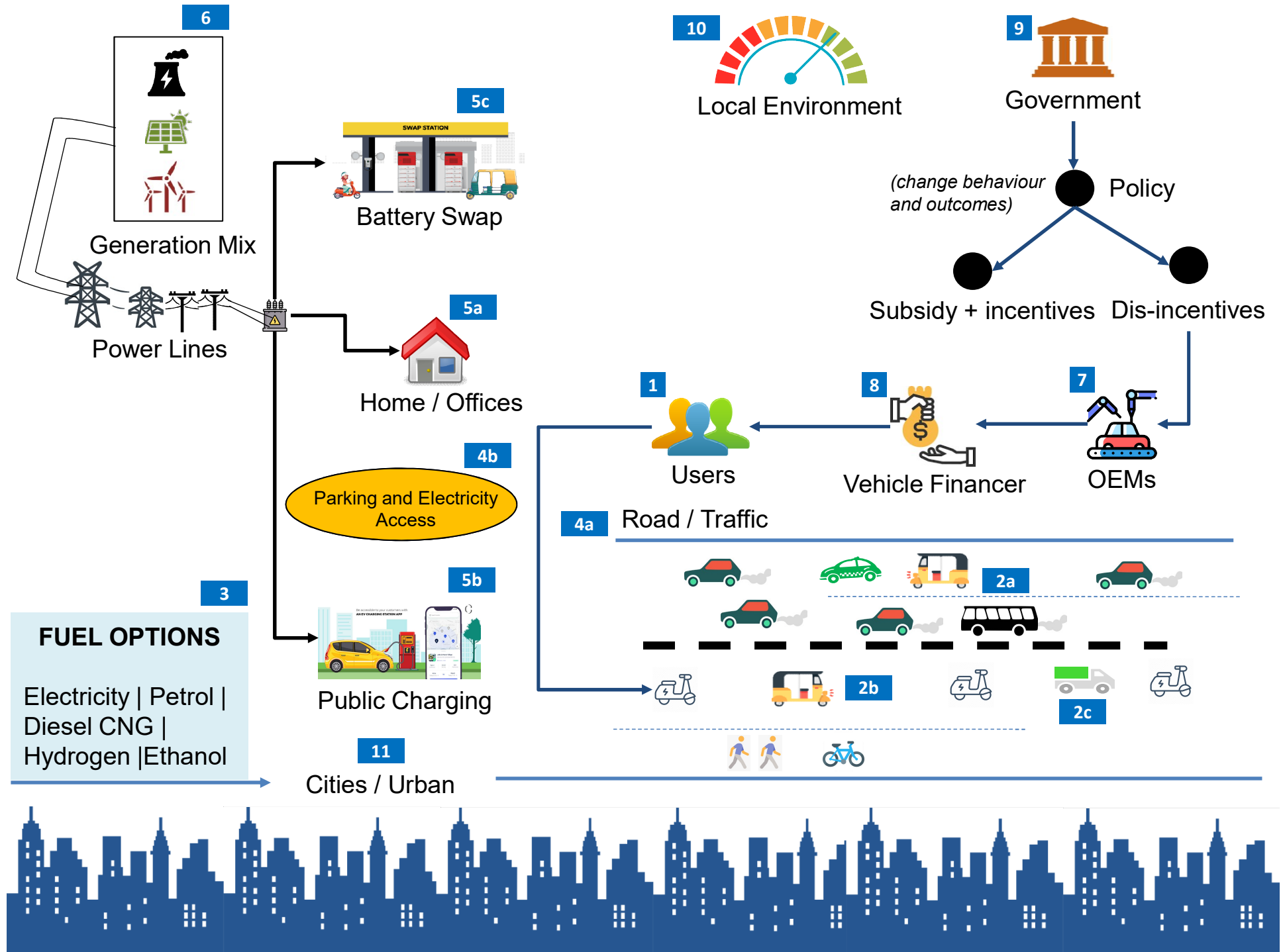


ANIL AGARWAL DIALOGUE 2020

NEXT-GEN SOLUTIONS – ELECTRIC MOBILITY

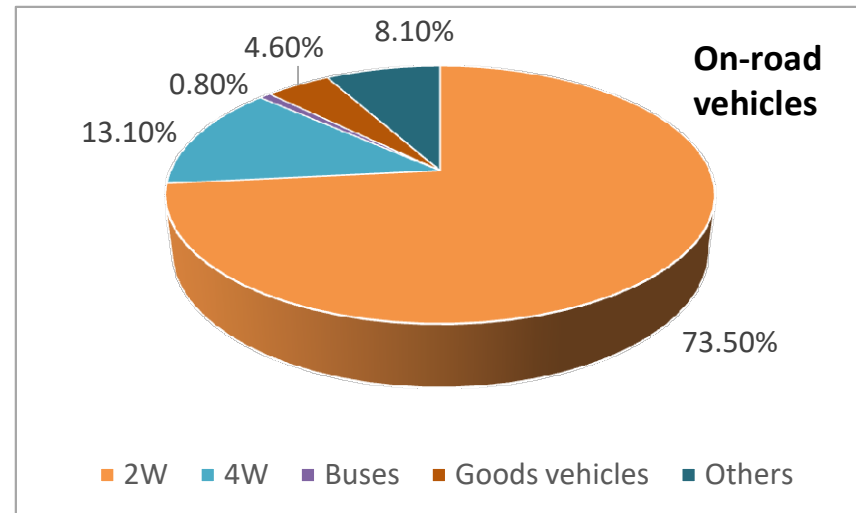
Rahul Bagdia, pManifold
AAETI, Rajasthan | 10th Feb, 2020





INDIA is different and so are its needs

- Largest **2W (74%)** and **3W (3%)** fleet on-road in the world
- Only **22 cars per 1,000** capita vs. 980 in USA. Still high congested and polluted cities.
- Only **1.2 buses per 1,000** capita vs. 6 in China and 8.6 in Thailand. Weak PT leading to increased individual vehicle ownership.
- Highly price and value sensitive market



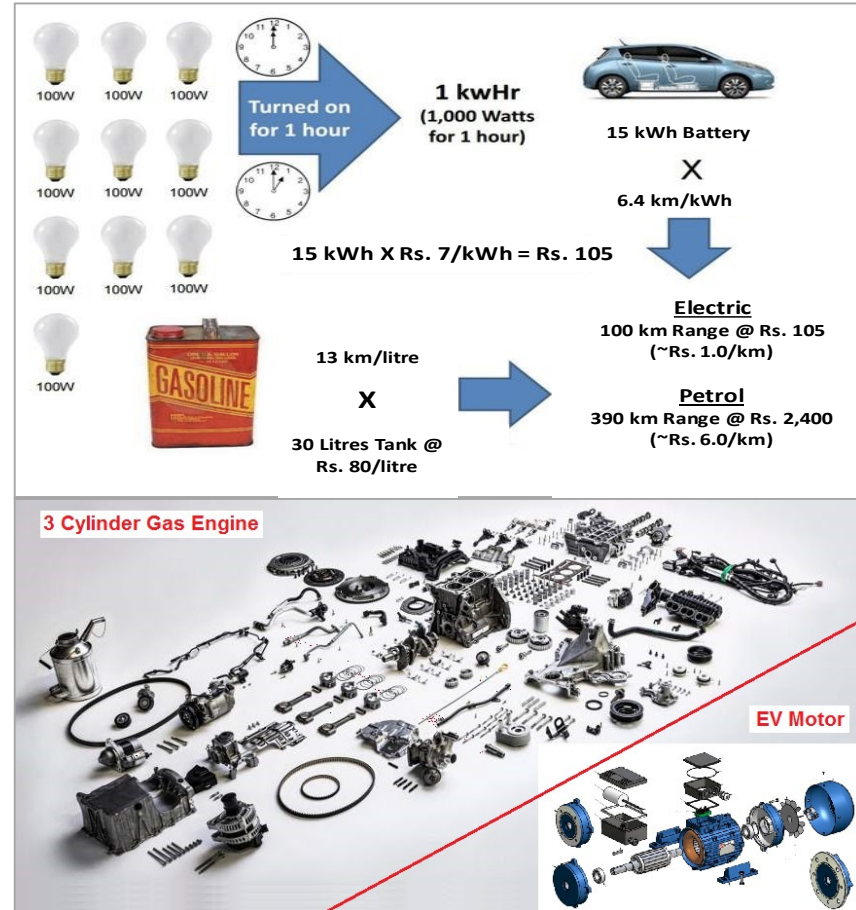
India is 4th largest AUTO market

- Total **250+ million** vehicles on road
- Total **26+ million** annual sales and net 20+ million added on-road
- High **31 million** production capacity of OEMs (15% exports)



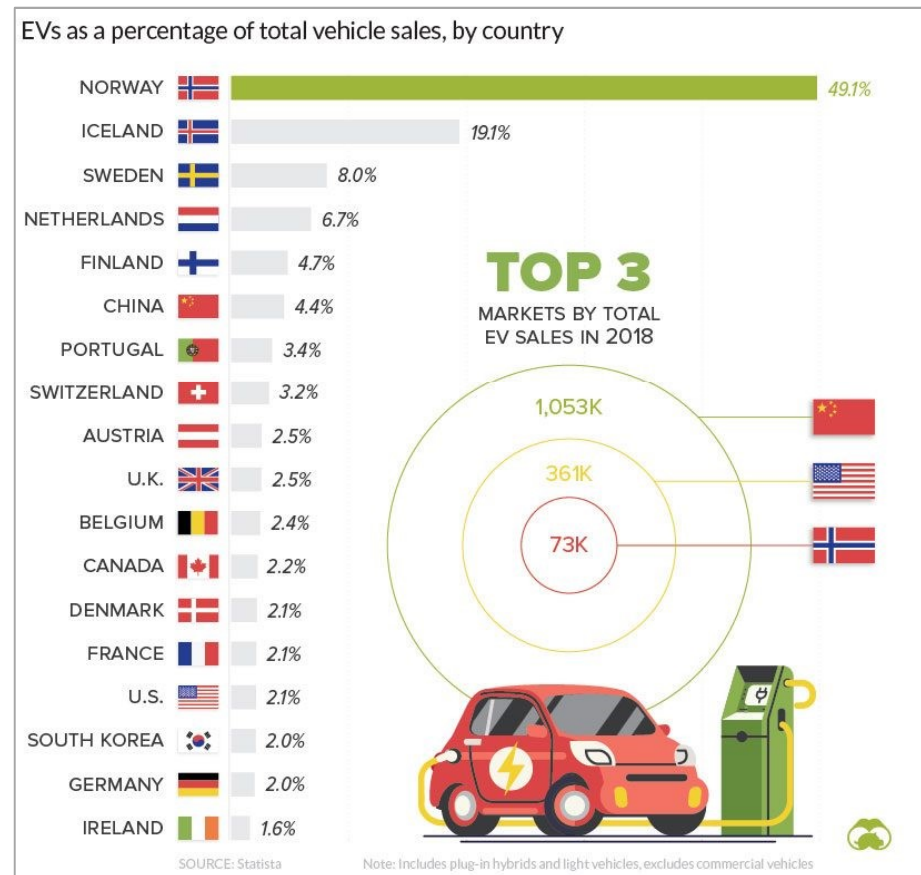
EV is a GLOBAL phenomenon now

- **5X Efficient** over ICEs (86% power to wheel vs. 17% in ICEs)
- **6X Economic** in terms of fuel cost. Lower TCO. Falling Battery prices will achieve price parity with ICEs by 2024.
- **Cleaner** in local air quality. Growing renewable mix will further improve its proposition.
- **Reliable** with **30X** lesser moving parts
- **Safer** as gasoline has **100X** energy mass than Lithium batteries
- Much better connected and shared



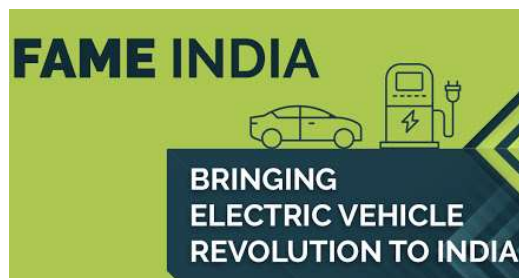
Why EVs are important for India?

- EV sales is growing fast globally. If India wants to safeguard its **exports**, its OEMs will need to build capacity faster.
- EV sales is growing slow in India*, but ~60% valued parts are imported (mostly from China). India needs to protect its industry from cheap **imports**.



** India EV sales share in FY2018-19: <0.1% in cars; <0.5% in 2Ws; <3% in STU Buses and >50% in 3Ws.*

EV Existing Landscape in India



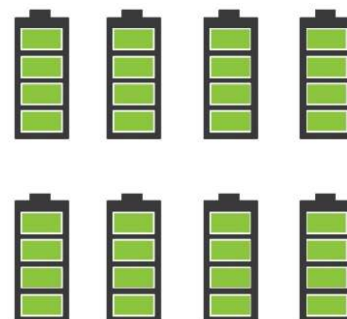
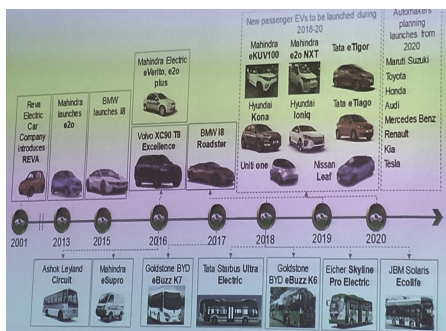
INR 10K cr. Incentives under **FAME II Policy**. 12+ States have announced **State EV Policies**.



De-regulated **charging services**. 2,636 public chargers to be deployed through incentives from DHI.



Other fiscal & non-fiscal incentives to EV buyers. **Mandatory EV chargers** in new buildings.



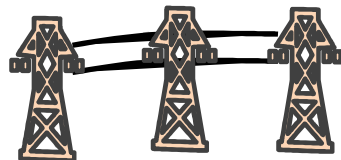
New EV models and **Supply chain ramping**. **Phase Manufacturing Plan (PMP)** to kick-off 50 GWh Integrated Cell & Battery manufacturing

EV Opportunity for India in 2030



	Scenario 1	Scenario 2
% EV Sales in 2030	100%	30%
Total EVs on road	~ 256 million	~ 84 million
% EV Share of Total Vehicle Stock	41%	14%

	Scenario 1	Scenario 2
Total Capacity Connected	~ 1045 GWh	~ 338 GWh
- Integrated LIBs	88%	88%
- Swapping + Range Extender LIBs	12%	12%



	Scenario 1	Scenario 2
Total Peak Load (including EVs)	464 GVA (27% EV contribution)	428 GVA (21% EV contribution)
Total Electricity Consumption (including EVs)	2,900 TWh (7% EV contribution)	2,820 TWh (4% EV contribution)

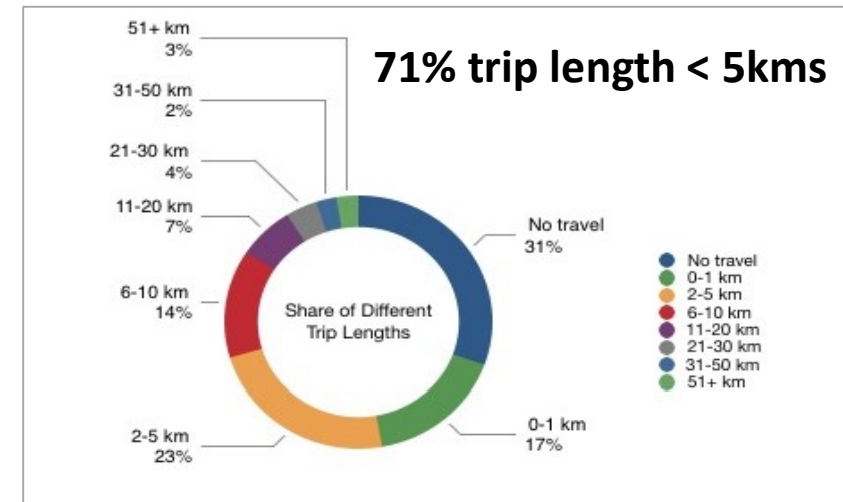
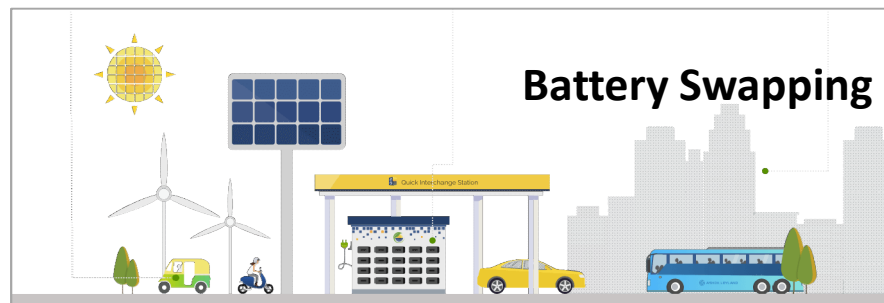
Peak power Management possible for optimizing Grid investments:

- Time-of-Use (TOU) Tariff system
- Solar add in the mornings and Wind in the nights can create favorable **renewable integration** and peak power reduction from EVs charging

Actively shaping Customer Choices

1 Range Anxiety

- Selection of optimum battery size to **meet daily commute** and keeping vehicle cost affordable
- Choosing **Battery Swapping** Opex model (for 2Ws and 3Ws)



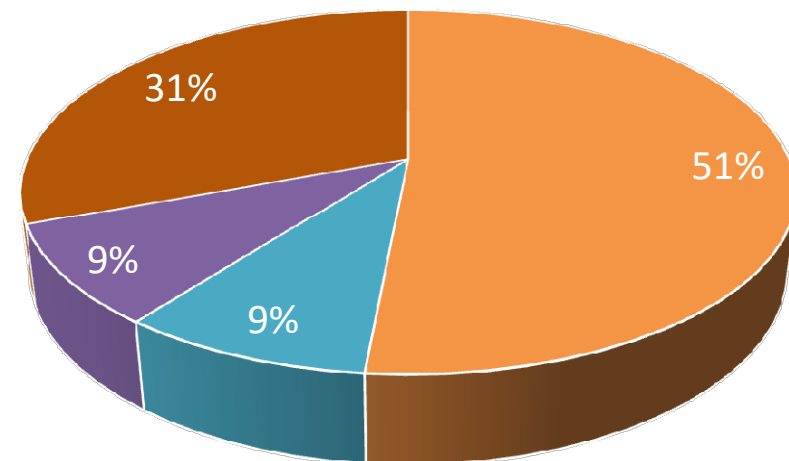
	ICEs	EV (Fixed Battery)	EV (Swap Battery)
2W	Rs. 3.5/km	Rs. 2.2/km (Range- 60km)	Rs. 2.1/km (Range- 60 km)
3W	Rs. 3.6/km (Petrol)	Rs. 2.9/km (Range- 60 km)	Rs. 2.2/km (Range- 60 km)
4W	Rs. 15.5/km (Petrol)	Rs. 13.20/km (Range- 100km)	Rs. 11.4/km (Range- 75 km)
Buses	Rs. 57.4/km	Rs. 56.2/km (Range- 100km)	Rs. 51.5/km (Range- 46 km)

Actively shaping Customer Choices ...

2 Charging Time/ Charger Type

- **Slow AC charging** at home, office and public parking lots
- **Fast AC/DC charging** at public charging stations
- **Battery swapping** + Range Extension for 2Ws and 3Ws

Number of EV Charges by location distribution



- Home charging
- Office/Private charging
- Public charging
- Swapping + Range Extender

Actively shaping Customer Choices ...

3 EV end-user Financing

- Existing high penetration of ICE vehicle financing in India:
 - ~40% in 2Ws
 - ~75% in cars
 - ~90% in Commercial Vehicles
- Need for design of right EV financing products
 - Building certainty in EV resale value through **Battery reuse and recycling***

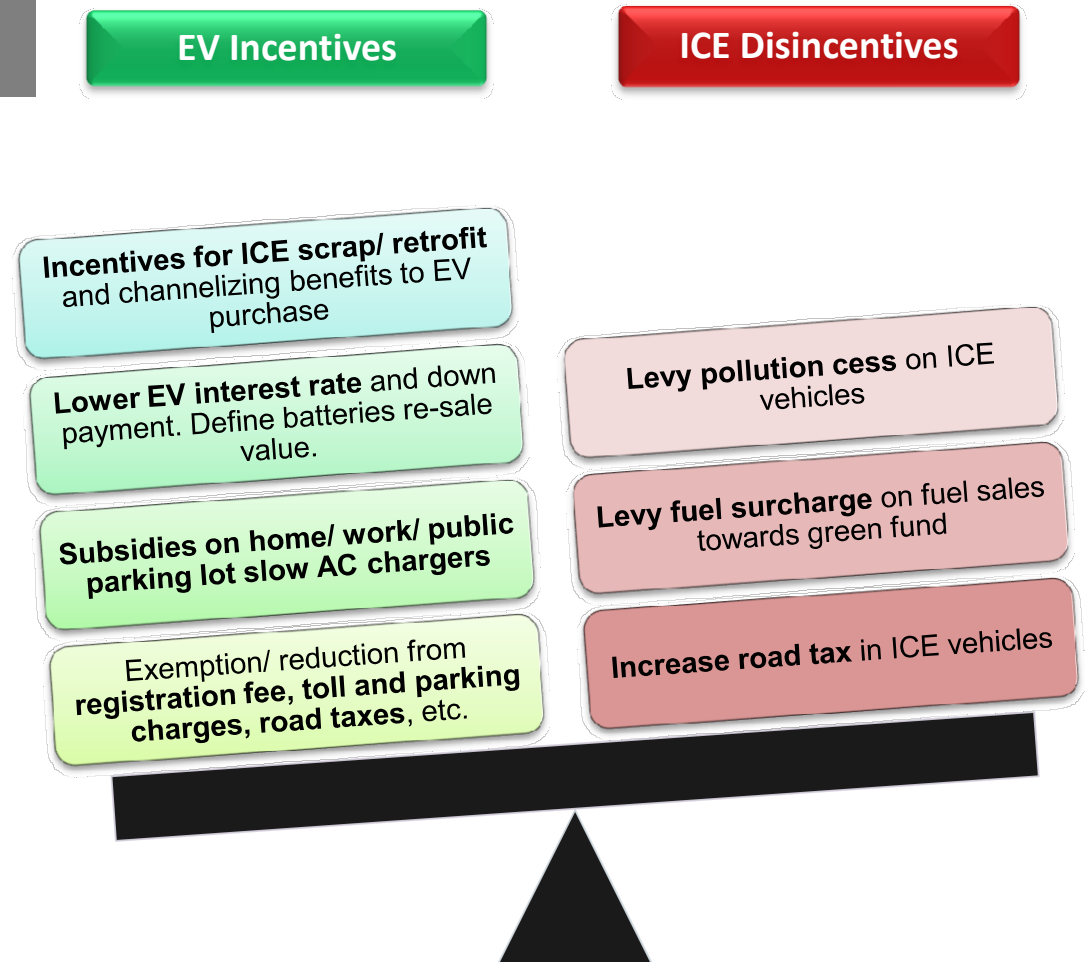


** Setting up Battery reuse and recycling plant in India will de-risk Lithium ion and other precious metal supply chain*

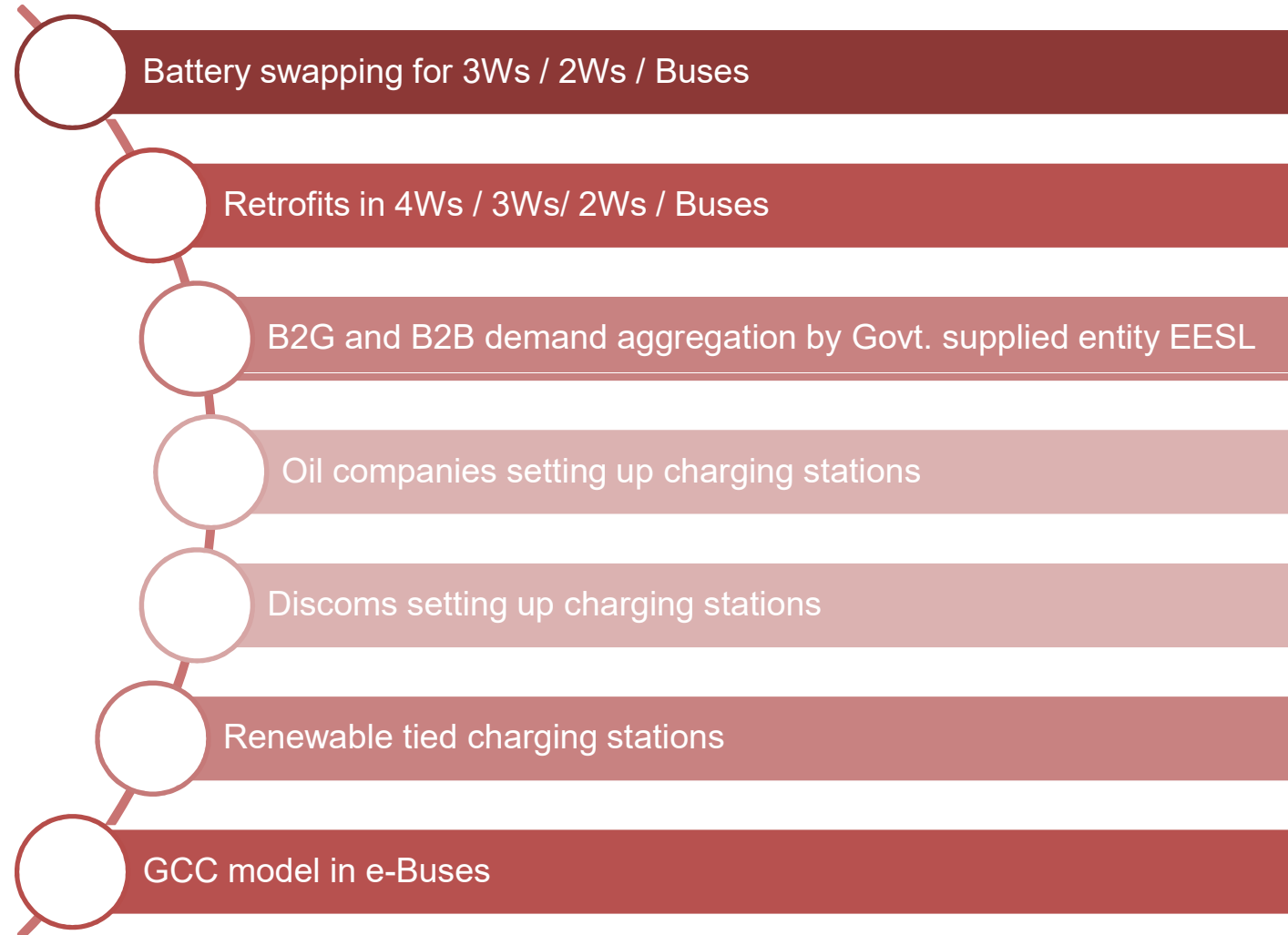
Actively shaping Customer Choices

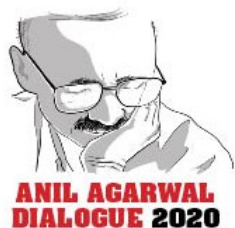
4 Incentives + Disincentives

- Balancing policy incentives to drive:
 - User adoption
 - Balance Govt. deficit from EVs



Emerging New EV Business models





OEMs & Retrofits



- Ather is setting their own charging network in the cities
- MG partnered with Fortum to setup charging station
- Ashok Leyland partnered with Sun Mobility for e-Bus battery swapping technology
- E-Trio retrofitting kits for 4Ws



- CSOs are providing different charging solutions to make EV attractive. For example, Fortum is providing fast charger solution while Magenta is setting up EV charger integrated with Solar
- Sun Mobility and Esmito are providing 2W and 3W battery swapping stations solutions

Discoms



- For Discoms, EVs charging business is an opportunity to tap new source of revenue recognition
- Tata Power signs MoU with HPCL to setup charging station in retail outlets across India

OMCs



- OMCs are partnering with charging station operators and fleet operators to provide charging as a service. Risk mitigation strategy.
- Esmito & BPCL offering battery swapping service for e-3W

Fleet Operators



- Ola has converted some fleet into electric. Plans to add more.
- Various fleet operators have emerged which are using ONLY EV as a fleet option to provide last mile connectivity solution
- Delivery start-up Zomato tied up with Yulu, Zoom car's PEDL, and other fleet operators

PSUs



- Power companies are partnering with fleet operators, municipalities and govt. organization to setup public charging stations

Note: This is not a complete list. It is for illustration purpose only.

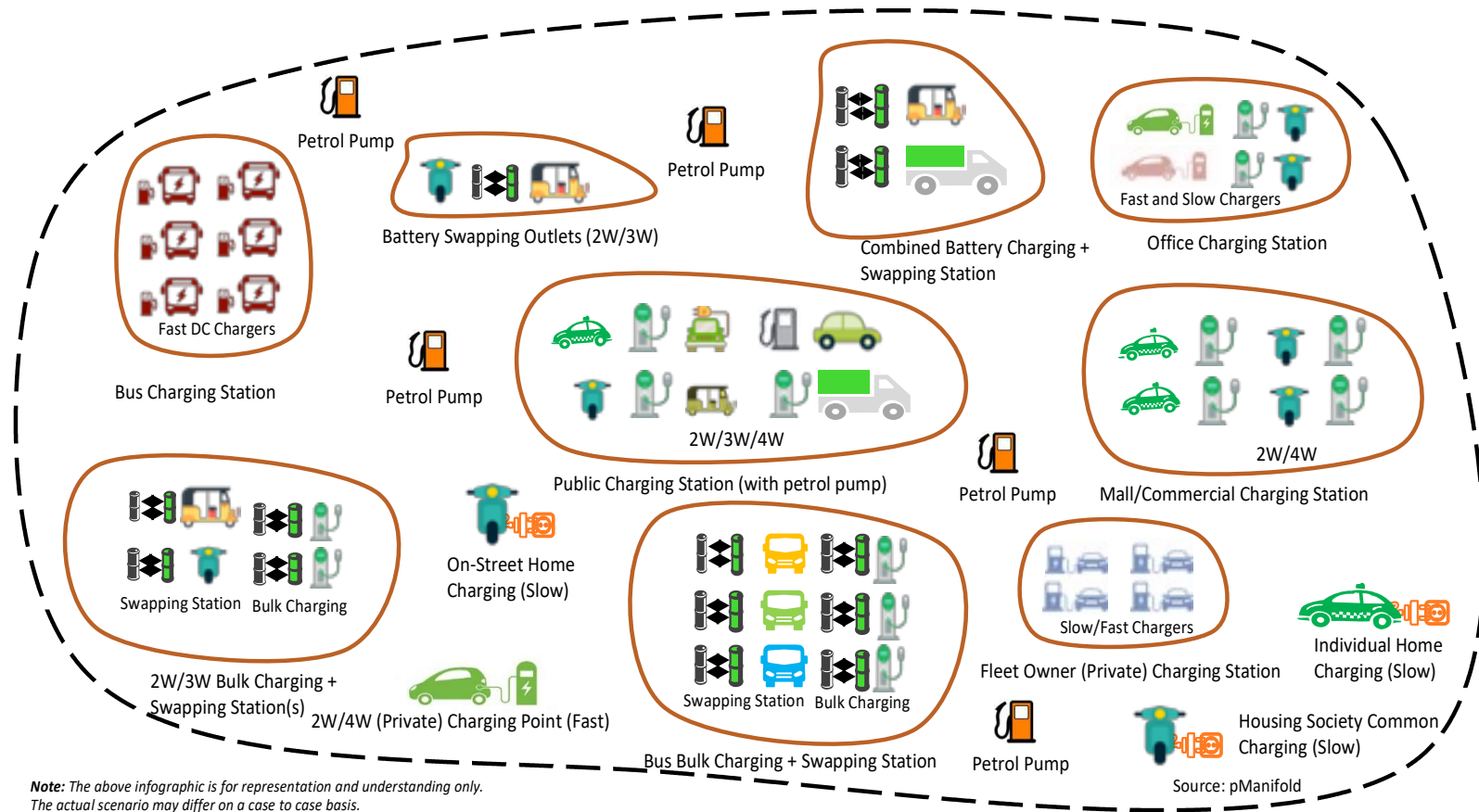


Most business strategies for EV fleet and charging services are catering to commercial fleet segment for its certainty in demand

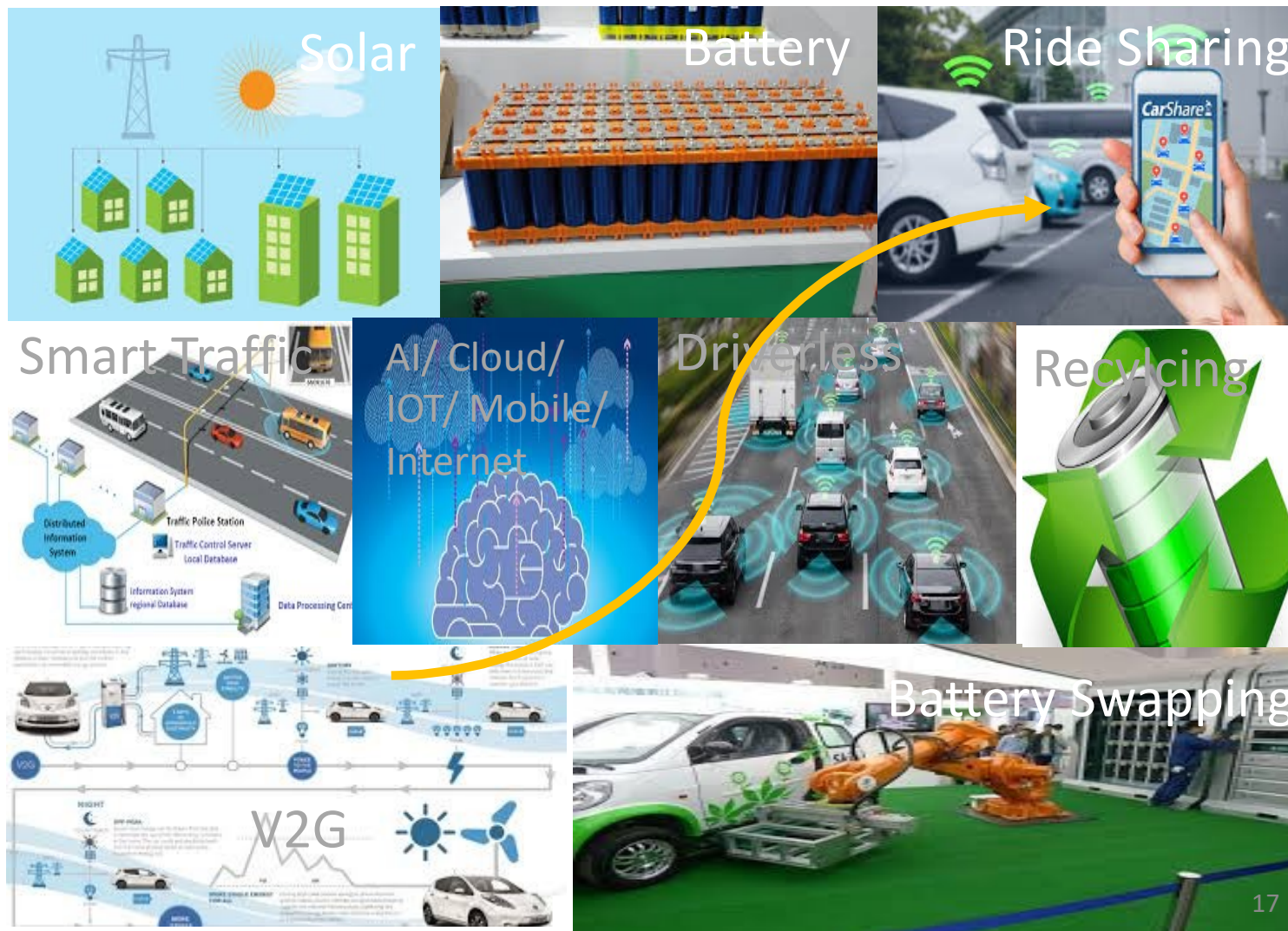
Shared EV fleet models are attractive



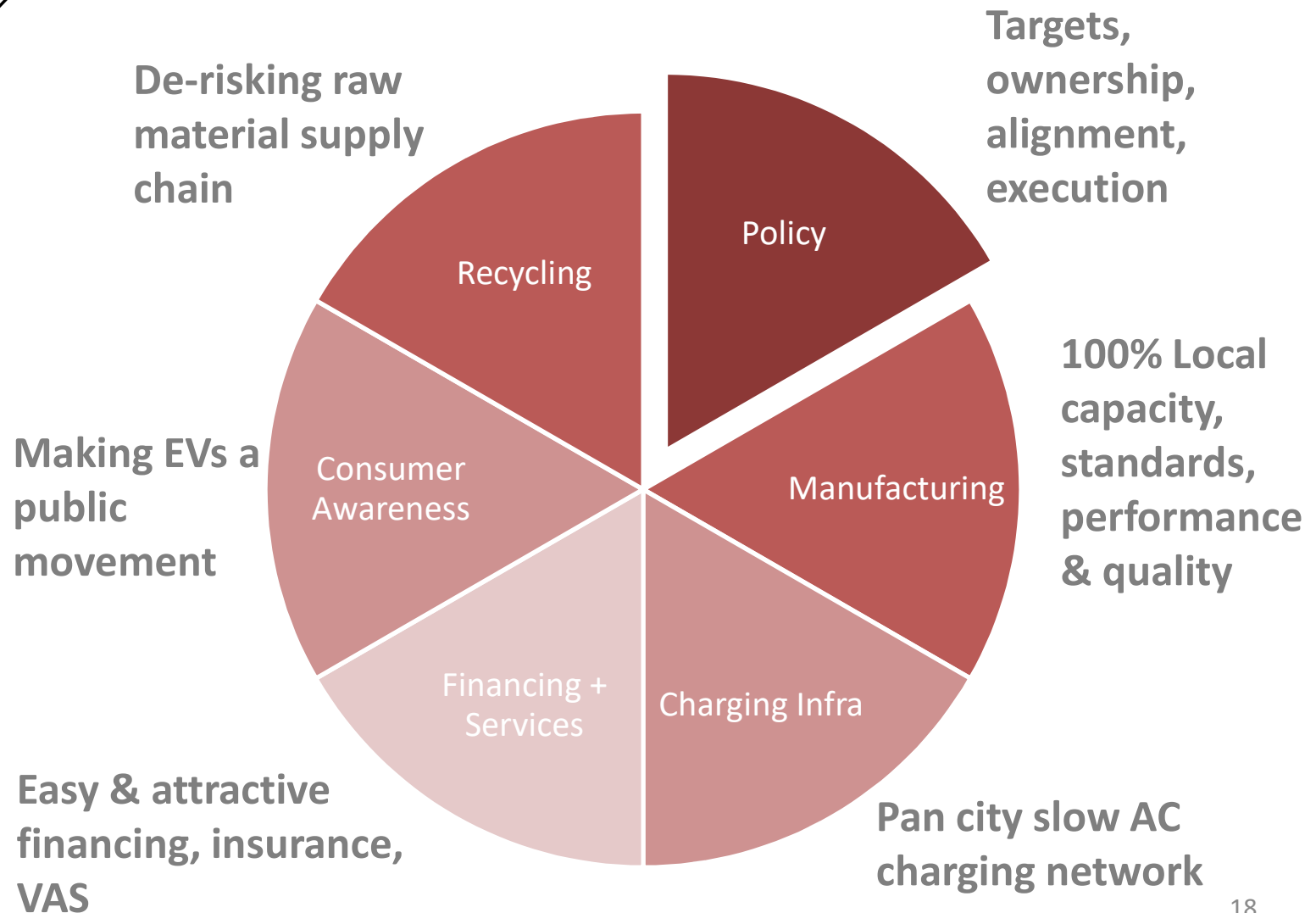
No one model will solve India's diversity

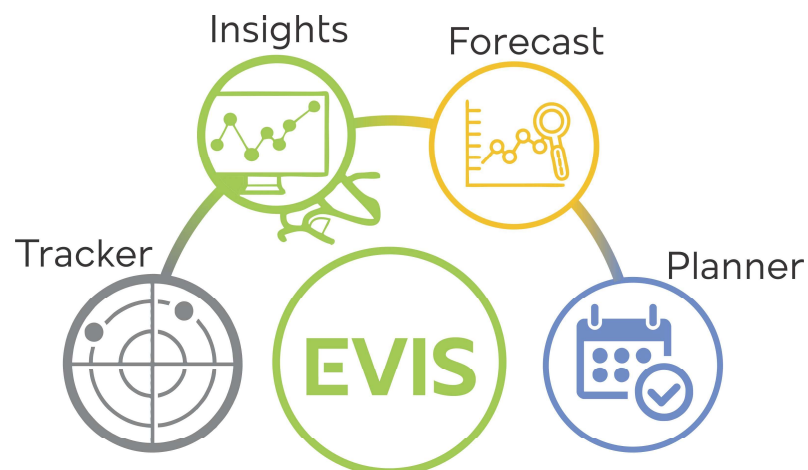


Convergence of Technology and Business Models happening



Active levers to drive EV inflection point in India





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