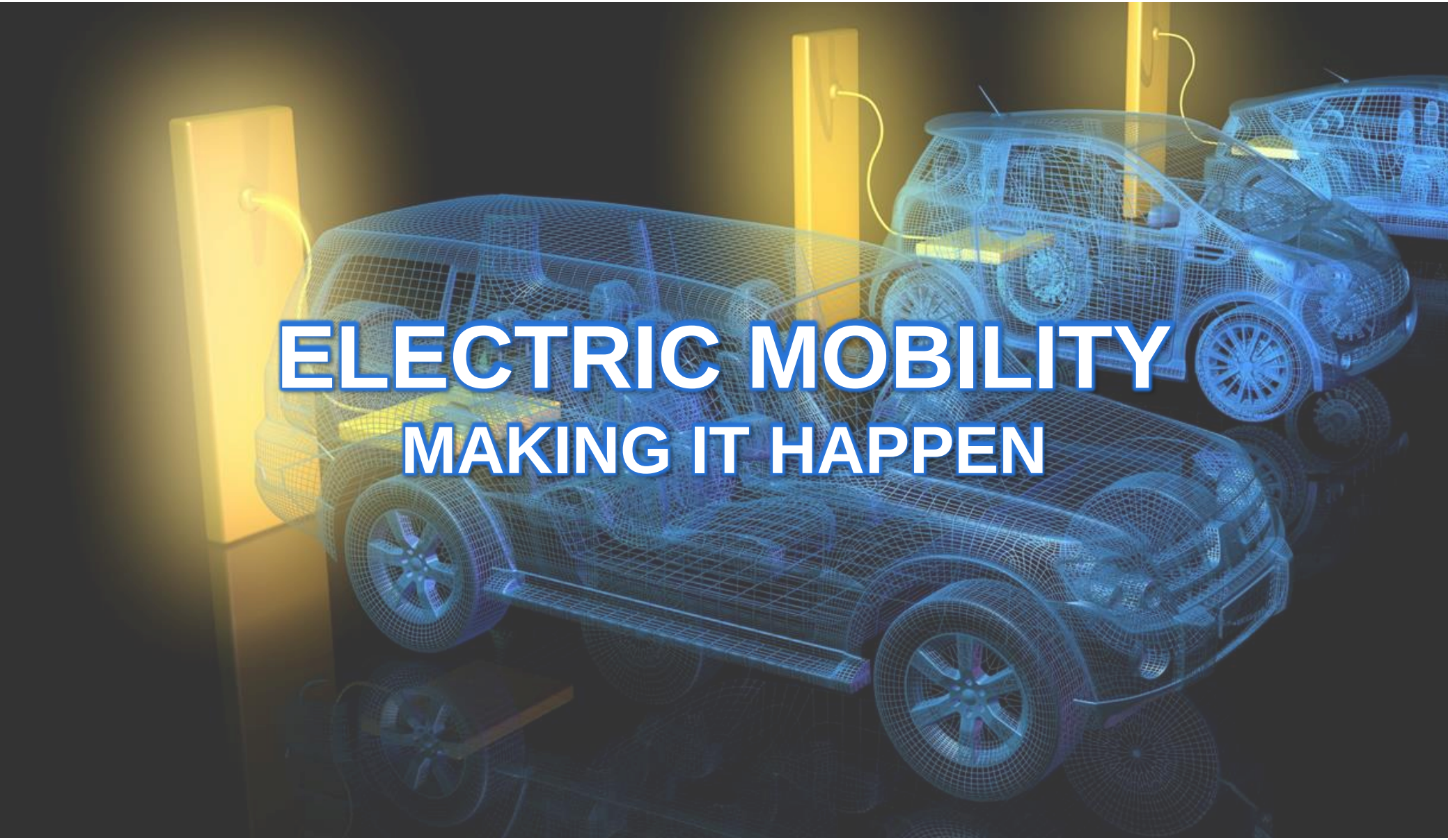


# Message from the President, ASSOCHAM

The shift to Electric Vehicles has caught the imagination of policymakers and industry, but speed bumps in policy and corporate landscape remain.

The year 2017 will be remembered as a significant one for defining India's mobility architecture. From big ticket announcements on the marque Ahmedabad-Mumbai high-speed rail project to Hyperloop, India has seized its moment in the sun to announce big plans for finding next generation transportation solutions.

But nothing has caught the imagination of the industry and policy makers quite like the government's ambitious plans for a mass scale shift to electric vehicles (EVs) by 2030 so that all vehicles on Indian roads by then – personal and commercial – will be powered by electricity. While the transformative push for electric vehicles has become a cause célèbre for India and the world, it presents challenges along with opportunities.

To understand perspective better, ASSOCHAM India's leading Apex Chamber for Commerce & Industry, is organizing the International Conference on Electric Vehicles, with the Theme Future Road Map for India.

I do look forward to a meaningful discussion on the future road map for the Electric Vehicles in India, thank the **ASSOCHAM Team** and our **NRI Consulting & Solutions India Pvt. Ltd.,** for this much needed Background Paper and convey my best wishes for the success of this Conference.

With warm regards,

**Sandeep Jajodia**
**President, ASSOCHAM**

# Message from the Chairman, ASSOCHAM National Council on Auto and Auto Ancillaries

The Indian Auto Industry is embarking on the path of Electric Mobility in line with the vision of The Government of India. Today, standing at the crossroads of an exciting period, I am happy that the industry has been given an opportunity to put forward its insights and recommendations.

In this direction, the paper prepared by NRI Consulting presents a set of comprehensive recommendations to ensure that the fundamentals of electric eco-system are strong and shaped effectively.

Through ASSOCHAM, I wish to unite the entire Industry under a single umbrella for efficient all-round collaboration, thereby ensuring a resounding success and 100% adoption within the timeframe set by GoI.

**R.S.Kalsi**
**Executive Director, Maruti Suzuki & Chairman, Automotive Council, ASSOCHAM**

# Message from the Secretary General, ASSOCHAM

ASSOCHAM, has always been on the forefront of supporting the Government and the Industry for the development of the Nation.

With the recent announcement of **The National Electric Mobility Mission Plan (NEMMP) and Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME India),** India has set a target of migrating to Electric Mobility by 2030. Therefore, to discuss and debate across the table with all the stakeholders the Chamber is organizing the International Conference on **"ELECTRIC VEHICLES: Future Roadmap for India" on Tuesday, 19th December, 2017 in New Delhi.**

This Paper jointly prepared by **ASSOCHAM** and **NRI Consulting & Solutions India Pvt. Ltd**., looks at the **Global perspective and Indian context on Electric Vehicles** and I am sure will be a reference book for the Industry.

We hope the discussion will be fruitful and shall meet its objectives.

I convey my very good wishes to the ASSOCHAM Team, for the success of this Annual Conference.

**D. S. Rawat**
**Secretary General, ASSOCHAM**

# Message from the Knowledge Partner

With the advent of Electric Vehicles, the global Automotive Industry is set to experience one of the biggest transformations. In line with the global developments, the Government of India has also formulated a vision for increasing EV penetration in India. It is essential for players in the industry to deep dive into the changes that this vision brings with itself so as to be able to navigate the challenges and capitalise on the opportunities offered.

In this paper, we have detailed out the 3Cs of Consumer Acceptance, Cost Reduction & Charging Infrastructure needed for achieving the vision as well as the global learnings from countries working to satisfy the 3Cs. The paper further elaborates the peculiarities of the EV ecosystem in India along all aspects in the EV Value Chain. Finally, keeping in mind the Indian Context, a set of policy recommendations are detailed out.

I hope the readers will find the information in this report insightful. I would also like to thank ASSOCHAM for giving us the opportunity to prepare a report on this important subject.

**Ashim Sharma**
**Partner, NRI Consulting & Solutions India Pvt. Ltd.**

**Before we take to sea, we walk on land.. Before we create, we must understand…**

***- Ernest Hemingway***

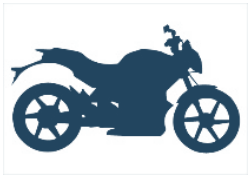
- INDIAN AUTOMOTIVE INDUSTRY
- ELECTRIC MOBILITY – INDIAN SCENARIO
- ELECTRIC MOBILITY – LEARNINGS FROM GLOBAL DEVELOPMENTS
- EV ECOSYSTEM – NAVIGATING THE CHALLENGES
- MAKING IT HAPPEN – POLICY RECOMMENDATIONS
- ABOUT NRI CONSULTING & SOLUTIONS

# INDIAN AUTOMOTIVE INDUSTRY

# Indian Automotive Industry is making significant contributions towards the Indian Economy

## India is world's…

**2nd Largest** — **2W Market**



**5th Largest** — **PV Market**

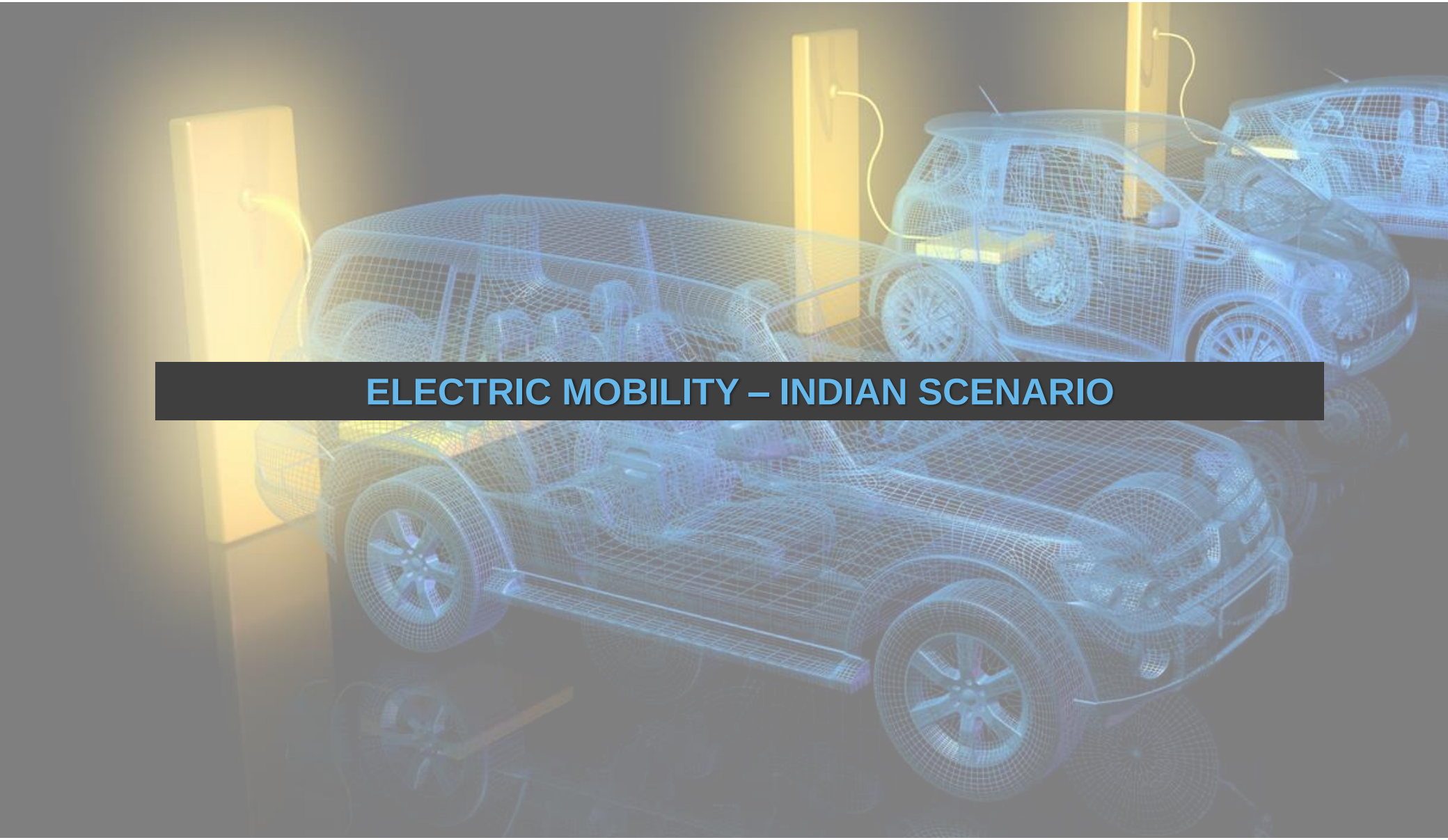
**7th Largest** — **CV Market**

## Indian automotive industry contributes…

| | | |
|---|---|---|
| 7.2% to GDP | 45% Manufacturing GDP | 4.3% Exports |
| 13% Excise Revenues | 7-8% Employment | 8% R&D Expenditure |

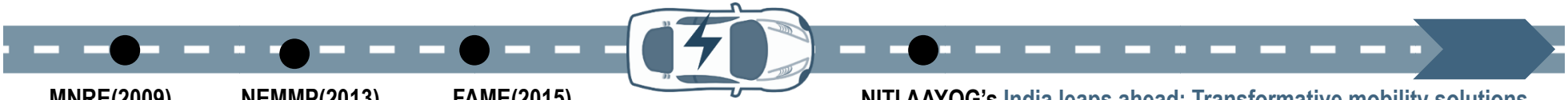


Source: ACMA, AMP 2026



# ELECTRIC MOBILITY – INDIAN SCENARIO

# With objective of Fuel import and $CO_2$ emission reduction, Government of India has started taking policy measures for electric mobility adoption



MNRE(2009) NEMMP(2013) FAME(2015)

DHI: NEMMP 2020 & FAME India Scheme

NITI AAYOG's India leaps ahead: Transformative mobility solutions for all (2017)

## The Road Till Now

**Promotion of Hybrid & Electric Vehicles (xEVs)**
**Current scenario:**
4 Wheelers: Electric Penetration: **~ 0.1% in FY17**
2 Wheelers: Electric Penetration: **~0.01% in FY17**

## The Road Ahead

100% public transport & 40% private EV sale by 2030
*"While a shared, electric, and connected mobility system is the pinnacle and end goal of India, additional xEV technologies can play important roles in cleaning the air, reducing congestion, saving lives, improving access, and strengthening India's economy today"*

### Measures for Promotion of Hybrid & Electric Vehicles:

**Purchase Incentives**
- FAME Subsidies implemented in form of reduction in prices to the customer
- Subsidies by certain state governments such as VAT & road tax relief

**Fiscal support**
- Government offered fiscal support in the form of reduced GST

**Promotion of R & D**
- **TPEM** (Technology Platform for Electric Mobility) initiative taken for promoting R & D by DHI & DST

### Measures for Promotion of Electric Vehicles:

**Demand Aggregation to kick start EV sales**
- EESL - Aggregating demand for procuring EVs for government use

**Infrastructure Development**
- Charging infrastructure development through involvement of PSUs & Discoms

**Supply Side Measures**
- Proposal to set up Li ion Battery manufacturing facility



Niti Aayog, NEMMP, Secondary sources

# Niti Aayog transformative mobility report outlines an ambition of having 100% EV in Public Transport and 40% EV in Personal segments by 2030

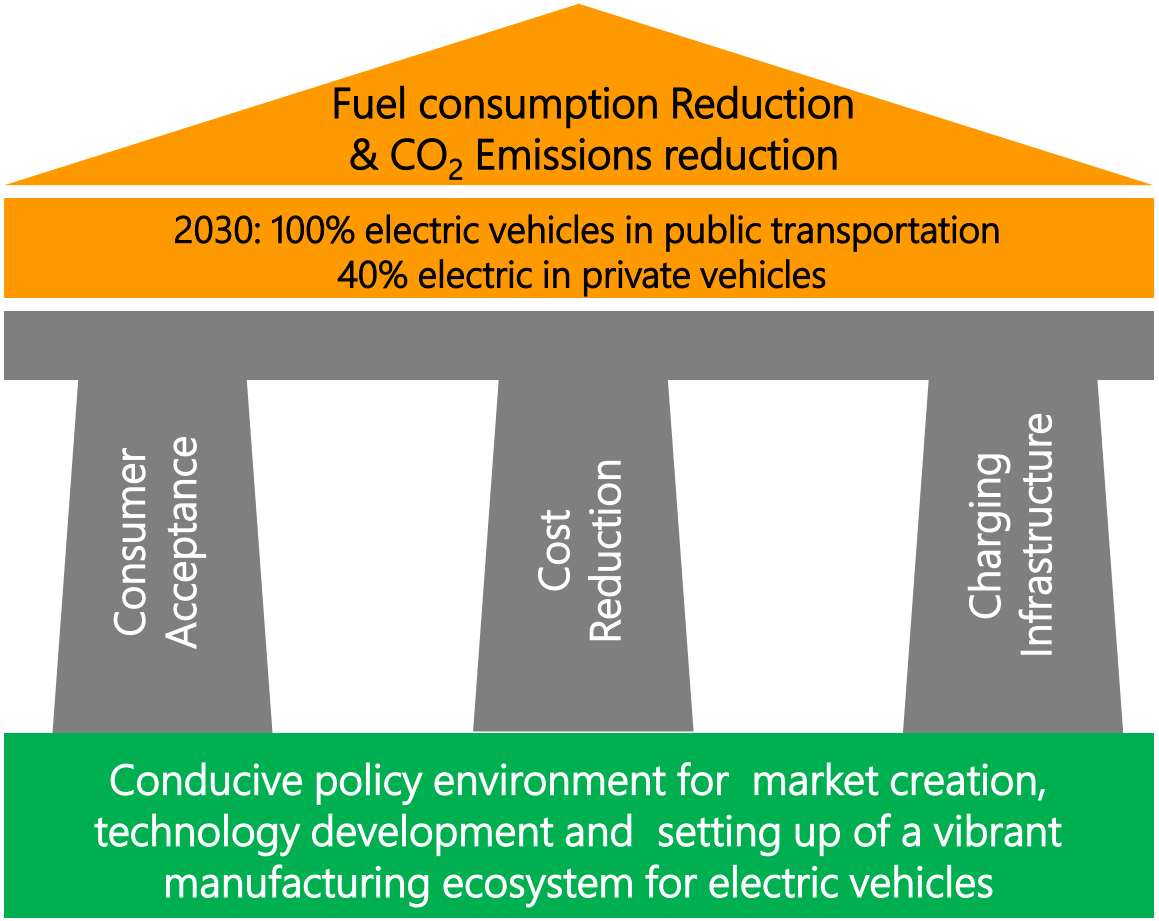
| CATEGORY | 2015 | 2030 | |
|---|---|---|---|
| | | Biz as Usual (BAU) | Transformative (%) |
| 2 Wheeler | 0 | 5 % | 40 % |
| 3 Wheeler | 0 | 5 % | 100 % |
| 4 Wheeler- PERSONAL | 0 | 1 % | 40 % BEV |
| 4 Wheeler- COMMERCIAL | 0 | 5 % | 100 % BEV |
| PUBLIC TRANSIT | 0 | 1 % | 100 % |

Above figures indicate EV new vehicle sale penetration



Source: Niti Aayog

# This can be achieved by focusing on Consumer Acceptance, Cost Reduction & Charging Infra. while building on the foundation of a Comprehensive Ecosystem






Source: Niti Aayog, NRI analysis

# Need for a comprehensive action plan in place to work on various aspects related to Consumer Acceptance, Cost reduction & Charging Infrastructure

## Consumer Acceptance

- Awareness Creation
- Value proposition (Acquisition Cost, TCO)
- Performance & Convenience

## Cost Reduction

- Local manufacturing (Make in India)
- Economies of scale
- (demand aggregation)
- Technology evolution,

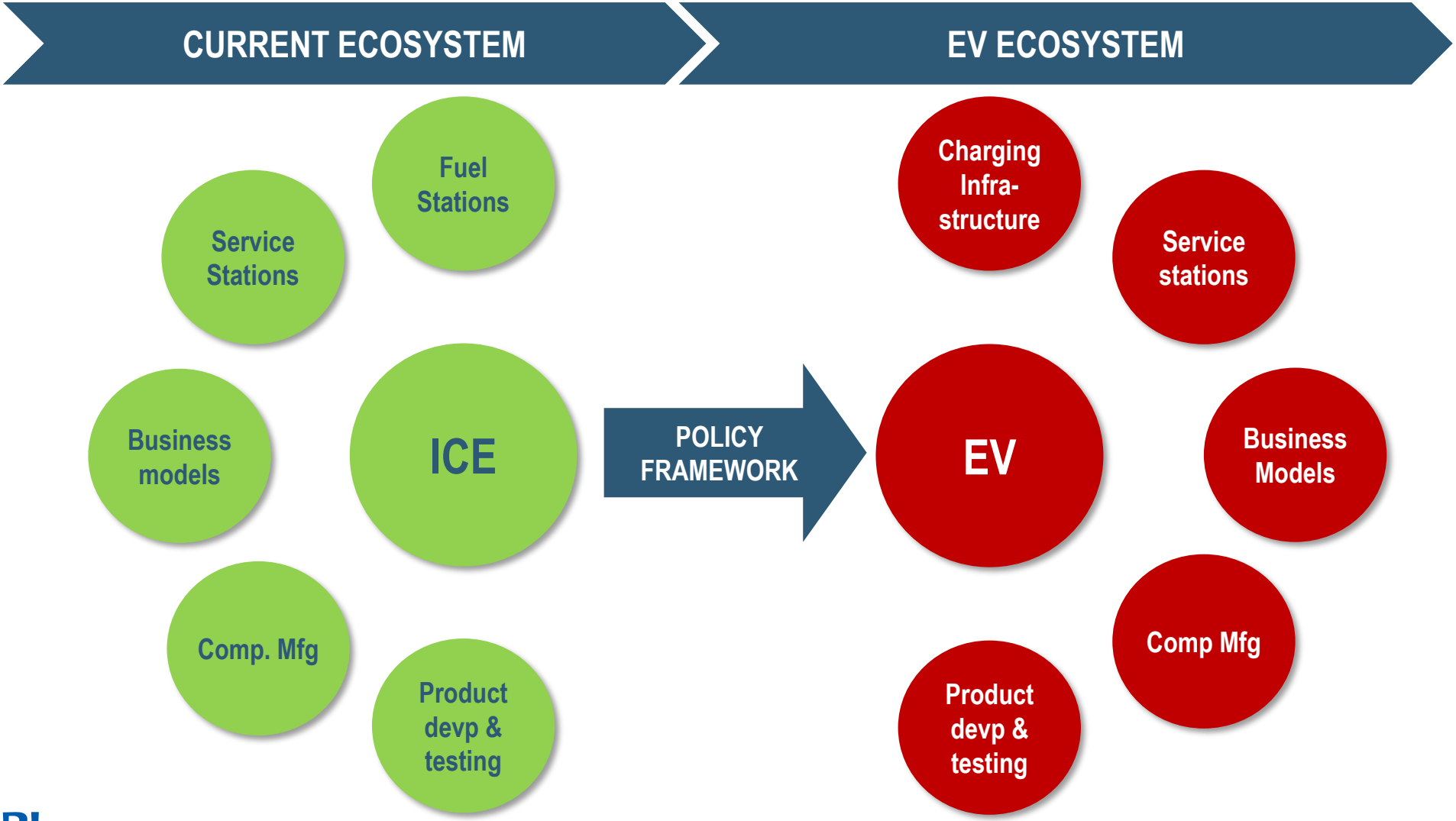
## Charging Infrastructure

- Accessibility (Ubiquitous)
- Time taken for charging
- Cost & ease of payment



Source: NRI analysis

# A long term & sustainable policy framework is necessary for creation of a vibrant EV eco system in India






Source: NRI analysis

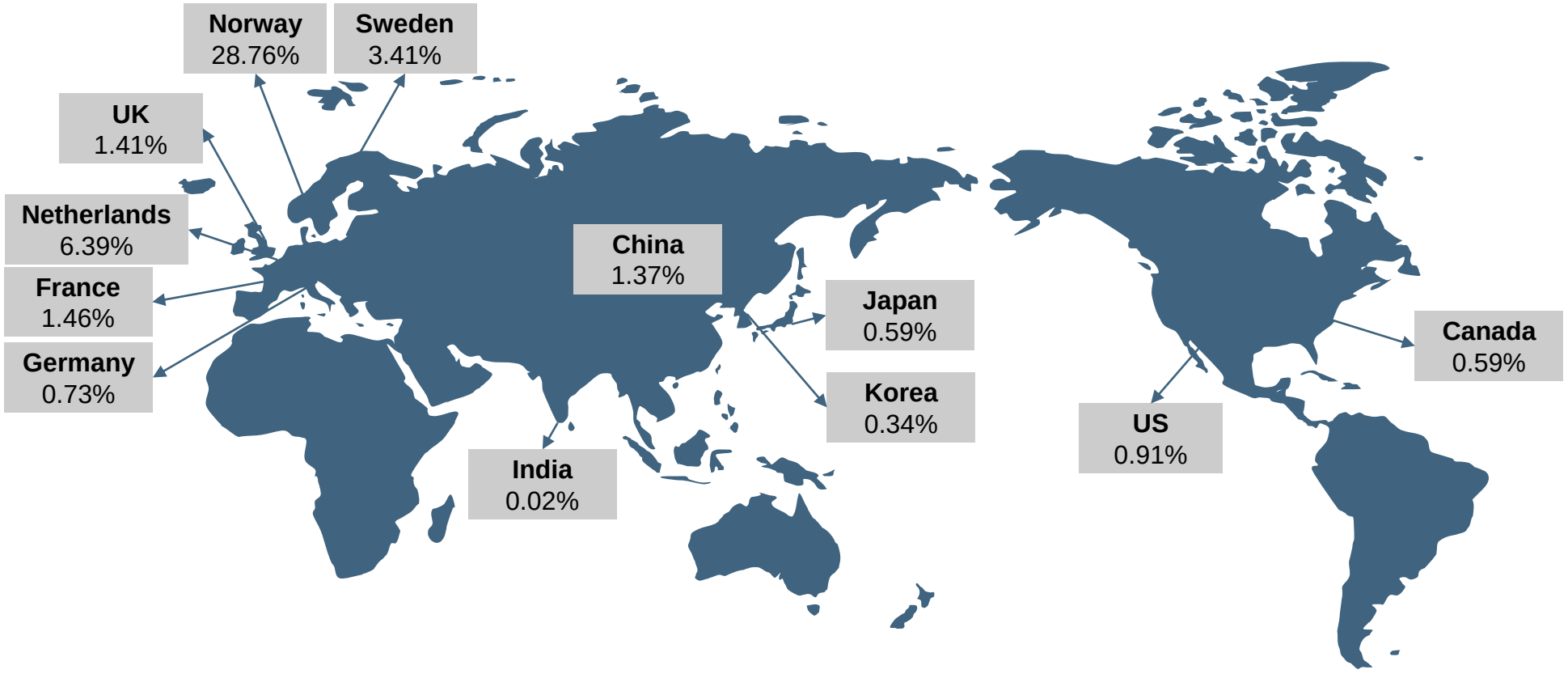
ASSOCHAM INDIA

NRI 未来創発 Dream up the future.

# ELECTRIC MOBILITY – LEARNINGS FROM GLOBAL DEVELOPMENTS

# Penetration of electric vehicles is picking up across the globe

## Electric cars (BEV and PHEV) market share by country (2016, in %)

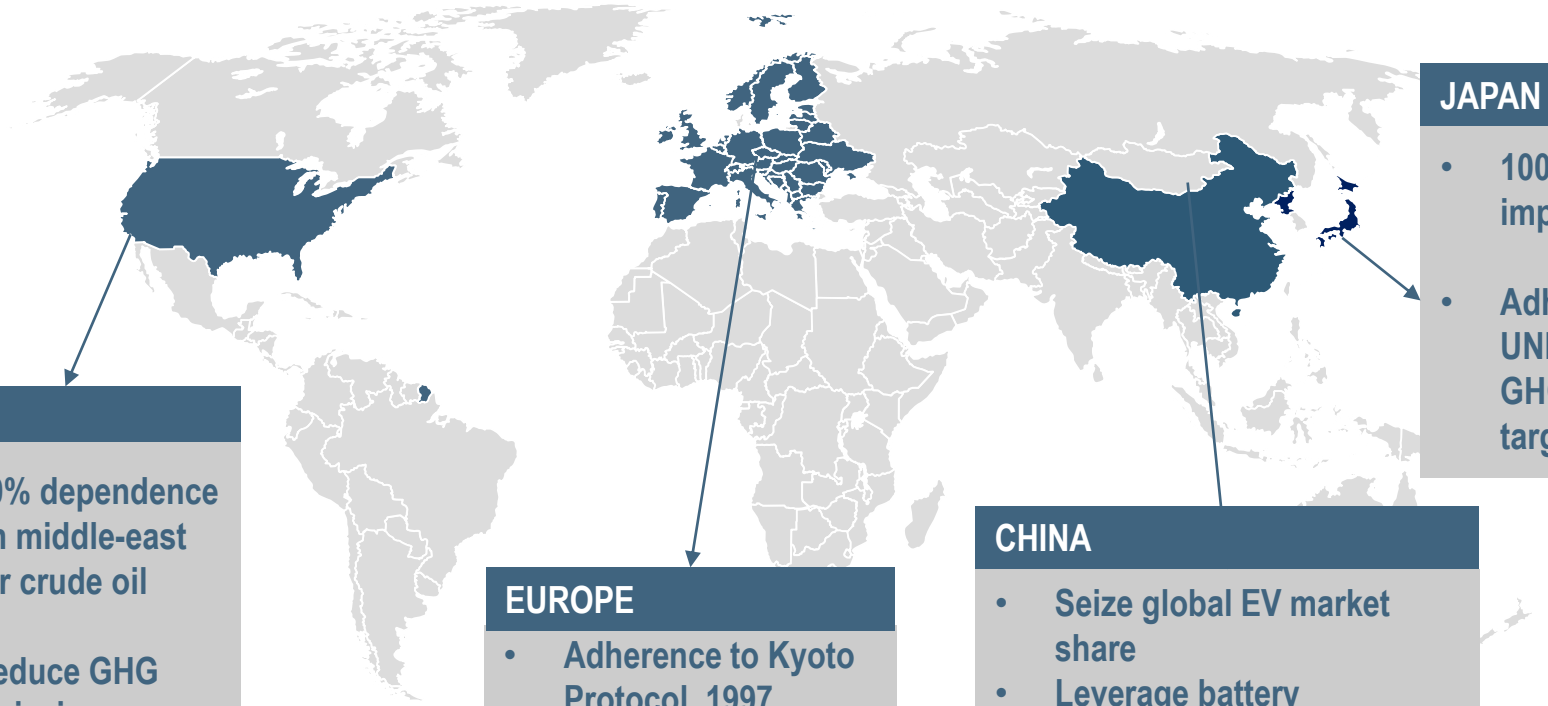





Source: Global EV Outlook 2017, IEA

# Worldwide electrification is being achieved differently due to different context and objectives in each country

## Context and objectives in each country



**US**

- 90% dependence on middle-east for crude oil
- Reduce GHG emissions

**EUROPE**

- Adherence to Kyoto Protocol, 1997
- NOx emission concerns
- Clean energy mix in Scandinavian countries

**CHINA**

- Seize global EV market share
- Leverage battery manufacturing advantage
- Largest producer of rare earth metals in the world
- Air pollution and GHG emission concerns

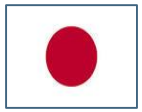
**JAPAN**

- 100% of oil imported in Japan
- Adherence to UNFCCC, 1992 GHG emission target



Source: NRI Analysis

# While BEVs are a promising solution to clean mobility, countries globally are spending billions of dollars to promote and incentivize these vehicles

| | EV+PHEV Penetration | EV+PHEV Sales (2016) | Average incentive per car (USD) | Total incentives expenditure (USD Mn) |
|---|---|---|---|---|
|  China | 1.37% | 3,36,000 | 8,753 | **2,941** |
|  Norway | 28.76% | 50,180 | 19,616 | **984** |
|  France | 1.46% | 29,510 | 7,540 | **223** |
|  Japan | 0.59% | 24,850 | 6,932 | **172** |
|  USA | 0.91% | 1,59,620 | 6,394 | **1,021** |
|  Netherlands | 6.39% | 24,480 | 6,223 | **152** |



Source: Global EV Outlook 2017, IEA

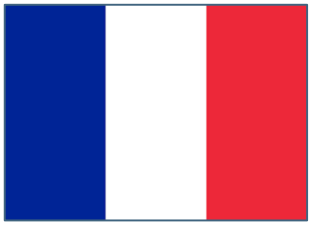
# While China has the maximum number of charging stations, as percentage of new car sales, the penetration is highest in Netherlands, followed by Japan

## Publicly accessible slow and fast chargers (2016, number of units)

1,41,254

8,157

40,473



15,843

23,250

26,789



Source: Global EV Outlook 2017, IEA

# Europe moving towards Electrification

The Telegraph

7 September, 2017

**Jaguar Land Rover will be all electric by 2020 but warns UK Government it risks being left behind**

*"We will introduce a portfolio of electrified products across our model range, embracing fully electric, plug-in hybrid and mild hybrid vehicles."* **- Ralf Speth, the chief executive, JLR**

The New York Times

5 July, 2017

***Volvo, Betting on Electric, Moves to Phase Out Conventional Engines***

*"We will introduce electrified cars across its model range, including fully electric, plug-in hybrids and mild-hybrid cars"* **- Hakan Samuelsson, Volvo Car Group CEO and President**

REUTERS

11 September, 2017

**Mercedes-Benz to offer electric option for every car by 2022**

*"We would have a portfolio ranging from mild hybrids, strong hybrids and fully electric vehicles by 2022"* – **Mercedes Benz at Frankfurt Motor Show, 2017**

The New York Times

26 July, 2017

***Britain to Ban New Diesel and Gas Cars by 2040***

*"Hybrid Vehicles exempt from 2040 diesel ban in Great Britain"*– **Department of Environment, Food & Rural Affairs, Great Britain**



Source: Business press

# All major global OEMs are committed to the electrification of their portfolio, combined push to hybrid and full electric

Ford

Chicago Tribune 6 January, 2017

Ford planning 13 electrified vehicles, including a hybrid F-150 and Mustang

**13** Electric models to be released in next 5 years

**6 out of 7** announced models are hybrids

| 2019 | 2020 | 2021 |
|---|---|---|
| Transit PHEV | Hybrid F-150<br>SUV BEV<br>Hybrid Mustang | Hybrid Taxi and police vehicles |

Volkswagen

FORTUNE 11 September, 2017

Volkswagen to 'Electrify' All 300 of Its Cars and SUVs by 2030

**80** Electrified models to be launched till 2025

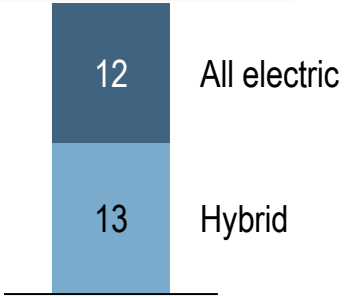

**All 300** models will be eventually electrified using a **mix of hybrid and electric** technology

BMW

THE DRIVE 8 September, 2017

BMW to Launch 25 Electrified Vehicles by 2025—Including Rolls-Royce and M Models

**25** Electrified models to be launched till 2025




HYUNDAI

Automotive News 4 April, 2017

Hyundai-Kia's grand electrification plan

Their catch-up plan: Launch 26 hybrids, plug-ins, electric vehicles and fuel cell vehicles by 2020. When accomplished, Lee promises, the rollout will catapult the group to the global No. 2 spot in electrified cars, ahead of all automakers but Toyota.

**10** Electrified models to be launched till 2020




Source: OEM's press releases, business press

# Key takeaways

1. World is moving towards electric mobility in a big way
2. Governments across the globe are providing huge infra support and consumer incentive for EV adoption
3. Electric vehicles & electrification of power train complement each other
4. Countries have devised policies based on their context (market size, consumer preferences, energy mix, availability of raw materials, etc.)



Source: NRI analysis

# EV ECOSYSTEM – NAVIGATING THE CHALLENGES

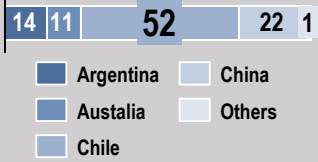
# India is at a nascent stage of electric mobility. Each & every component of the EV ECOSYSTEM needs a detailed focus

## RAW MATERIAL

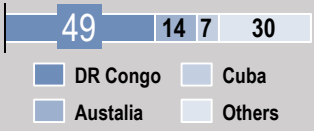
**$51 Billion**
**Trade Deficit with China**

Share of global reserves (in %)

**Lithium**




**Cobalt**




China increasing ownership of Li and Cobalt reserves globally

**Need to secure raw material supply independent of China**

## COMPONENT MAUFACTURING

- Lithium ion cell
- \+ Lithium ion battery
- \+ Power electronics
- \+ Electric motor
- \+ Charging system

- 60% of EV cost is Lithium cell, battery, motor and power electronics, majority of which is imported
- Discussion in India is only on battery assembly which is 10% of the cost

**For TRUE Make in India, manufacturing of EV components to be indigenised**

## VEHICLE MANUFACTURING

**OEMs** gearing up for electric mobility (Mahindra, Tata, Hyundai, Maruti, Toyota etc.)

**Fleet** (Bus, 3W, Taxis) have higher viability due to higher running: **100% BEVs 2030**

**Private vehicles** limited viability due to lower running:
- 40% BEVs 2030
- Balance 60% ICEs to be addressed through partial electrifications via Hybrids

**Govt. support imperative for mass adoption of EVs**

## CHARGING INFRASTRUCTURE

Total number of community charging stations in India currently[1]

**253**

1) Source: Plug in India

**Geographical presence of charging stations in India**


**Need to introduce enabling regulations to expand charging infrastructure**

## SKILL AND SERVICE DEVELOPMENT

Increased electronic components in EVs

- **India currently lacks suppliers and skills for EV components**
- **7~8 Million manpower needs skill upgradation**

**Need dedicated focus on skill development of large workforce**

## RECYCLING

**Hazards associated**

- Residual charge
- Toxic-by products
- HF Gases

- Improper treatment of used batteries can cause potential damage to human life
- Recycling of Li to reduce import dependence

**Need for a proper Lithium recycling mechanism and regulations**



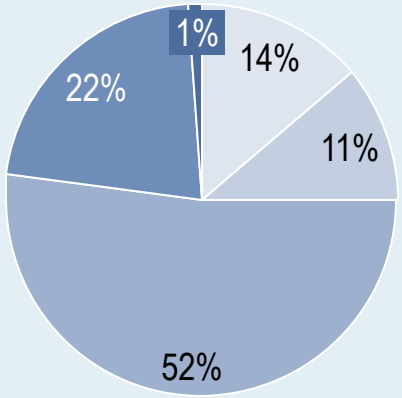
Source: USGS, EIDB, Niti Aayog, Secondary Research, NRI analysis

# Lithium reserves are geographically concentrated with increasing dominance of China, so securing a stable Lithium supply is crucial

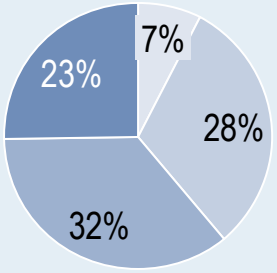
## Geographically concentrated reserves of Lithium

### Total global Lithium reserves[1] 14 MT

#### Distribution of reserves (in %)

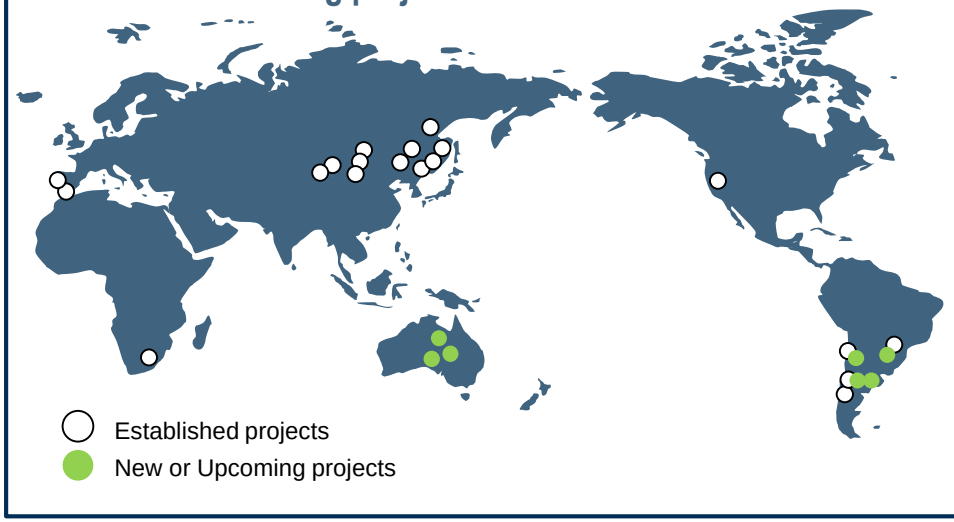



#### Lithium demand by application (2014, in %)

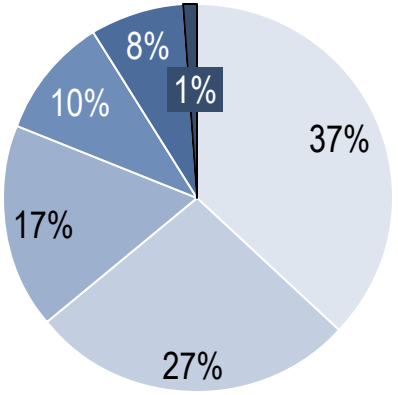



Lithium is used in multiple applications but with significant push to EVs, EV batteries will become the biggest application

#### Global Lithium mining projects




In addition to having highest market share of Lithium production, Chinese companies are buying stakes in global Lithium mining companies




1. USGS January 2017 estimates



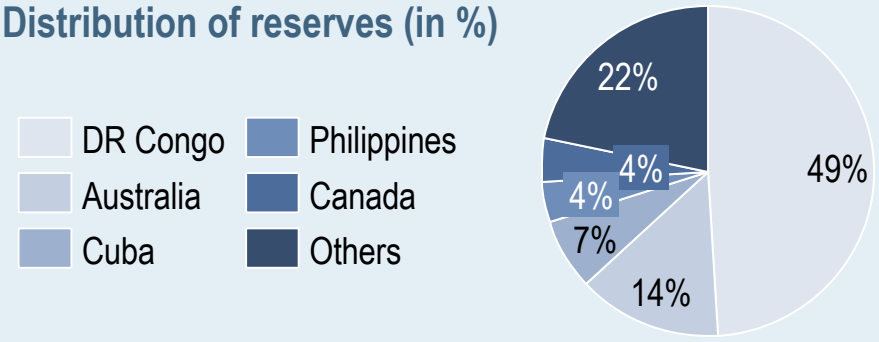
Source: USGS, Business press

# Cobalt reserves are concentrated in Congo and China is buying stakes in largest cobalt mines, India needs to be careful about dependency on China

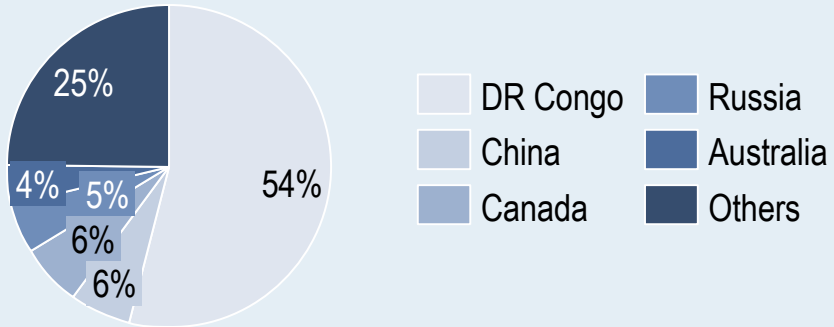
## Global scenario of Cobalt

### Global Cobalt reserves[1] 7 MT

#### Distribution of reserves (in %)

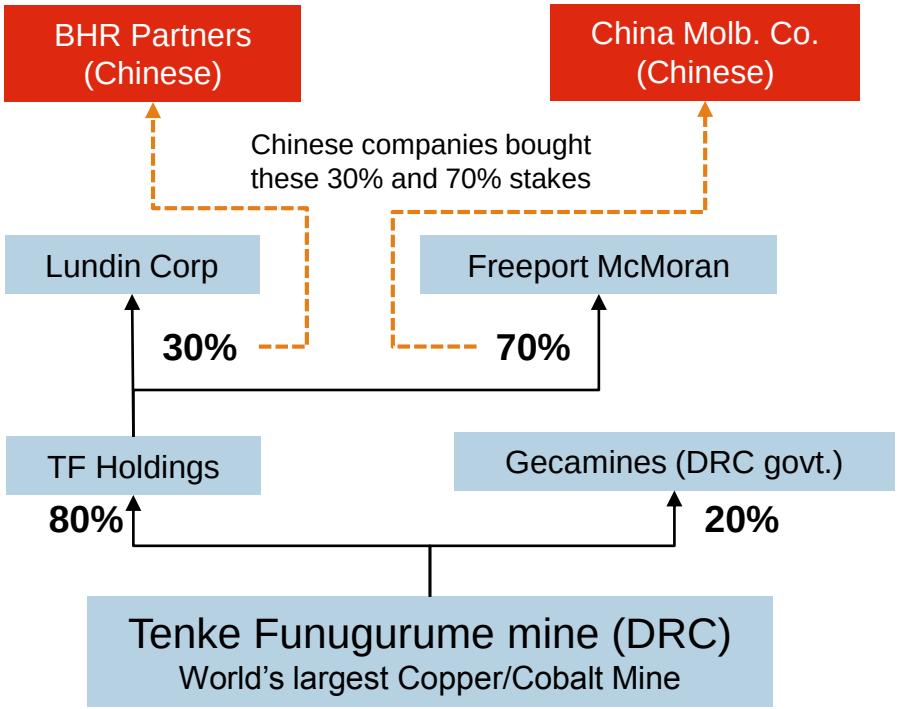



#### Share of total Cobalt production (2016, in %)




## China's presence in Cobalt mines

Two Chinese companies have acquired an effective **80%** stake in one of the world's largest cobalt production mine in DR Congo



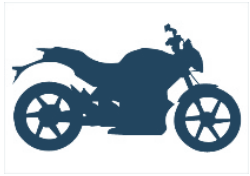

1. USGS January 2017 estimates



Source: USGS, Business press

# At current technology level, EVs will be priced much higher than a comparable IC engine vehicle, especially for small cars and 2 wheelers

## 2W



| | < 125 CC | 125 – 200 CC | > 200 CC |
|---|---|---|---|
| % of Total (FY17) | 84 | 11 | 5 |
| EV price compared to ICE | 2.3 ~ 2.9 X | 1.8 ~ 2.6 X | 1.0 ~ 2.0 X |

## 3W

| | Passenger Carriers | Goods Carriers |
|---|---|---|
| % of Total (FY17) | 82 | 18 |
| EV price compared to ICE | 1.0 ~ 2.0 X | 1.9 ~ 2.6 X |

## Cars

| | Small | Large |
|---|---|---|
| % of Total (FY17) | 75 | 25 |
| EV price compared to ICE | 2.3 ~ 2.9 X | 1.3 ~ 1.8 X |

## Buses

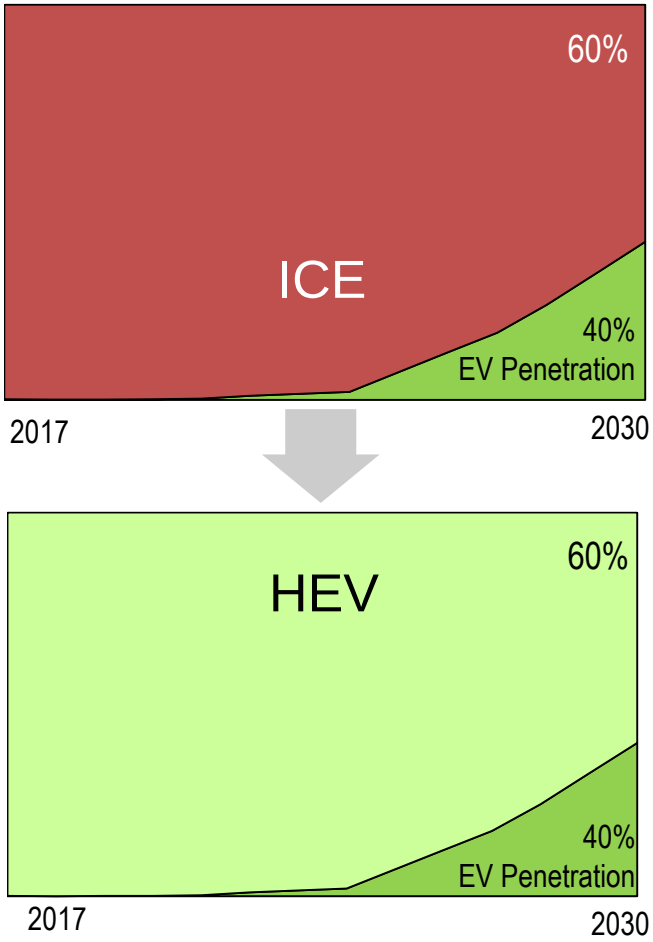
| | Small Bus (7.5-12 tonnes) | Big Bus (12-16.2 tonnes) |
|---|---|---|
| % of Total (FY17) | 43 | 57 |
| EV price compared to ICE | 2.2 ~ 3.0 X | 1.6 ~ 2.4 X |



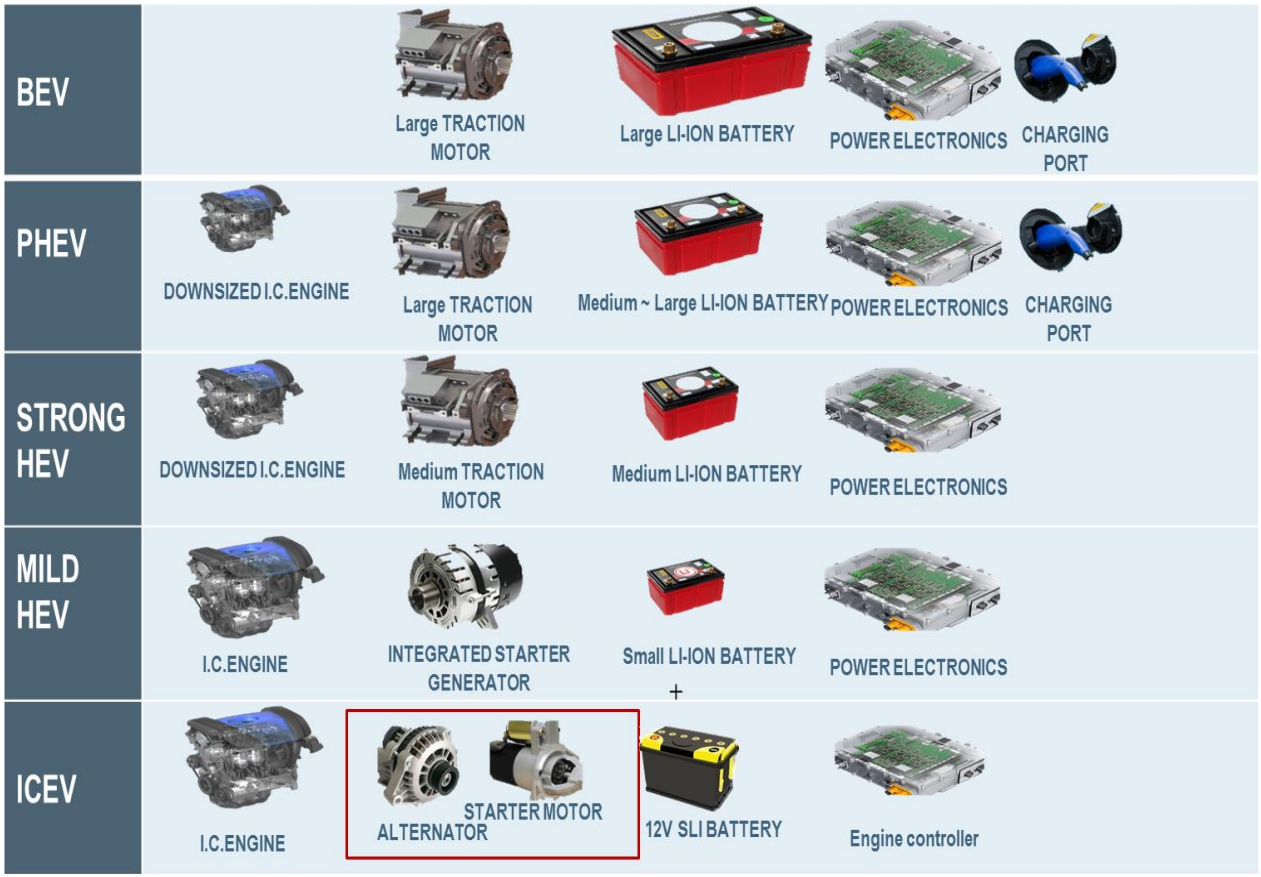
Source: NRI Analysis, SIAM annual sales data

# In addition to the ambition of 40% electrification of personal vehicles, Full / partial electrification of remaining 60% will help in fuel savings, $CO_2$ reduction & catalyse smooth evolution of electric component manufacturing ecosystem

## Transformation image




## Key components of hybrid and electric vehicles are similar

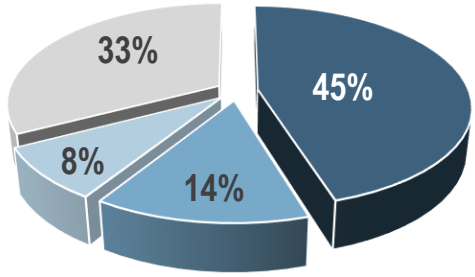





Source: NRI analysis

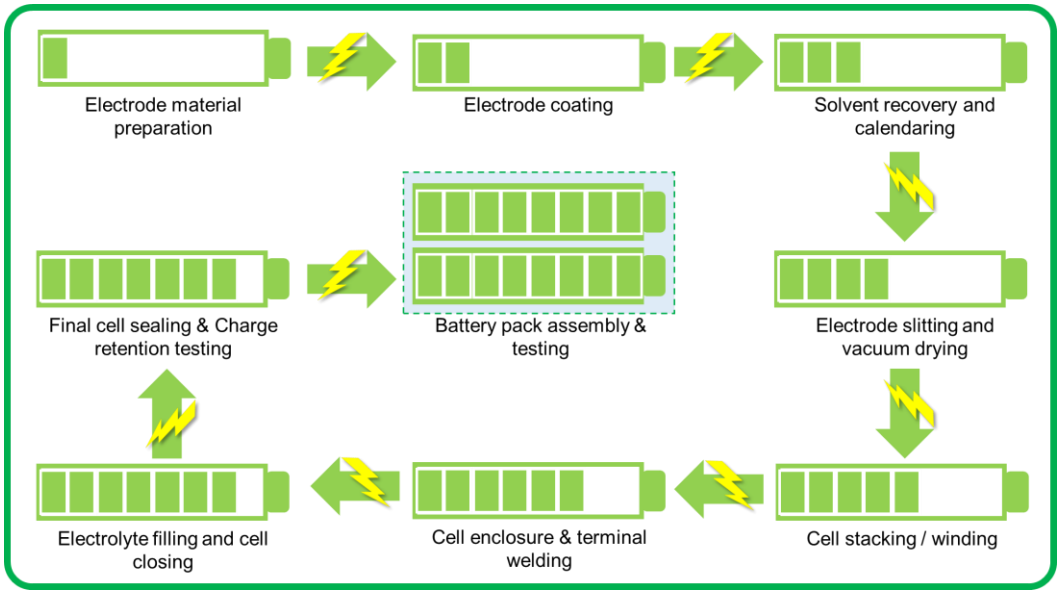
# A vibrant manufacturing ecosystem needs to be developed to provide scale & localise manufacturing, thereby, leading to reduced costs of EV components

## Cost break-up of an electric car




- Electric powertrain (Battery, Charger, Motor, Transmission & Controllers) consists of ~65-70% of the EV cost
- Handful of global players dominate the manufacturing of these components
- To bring down costs and reduce import dependence, an EV manufacturing ecosystem needs to be developed

## Typical Lithium-ion battery manufacturing layout:



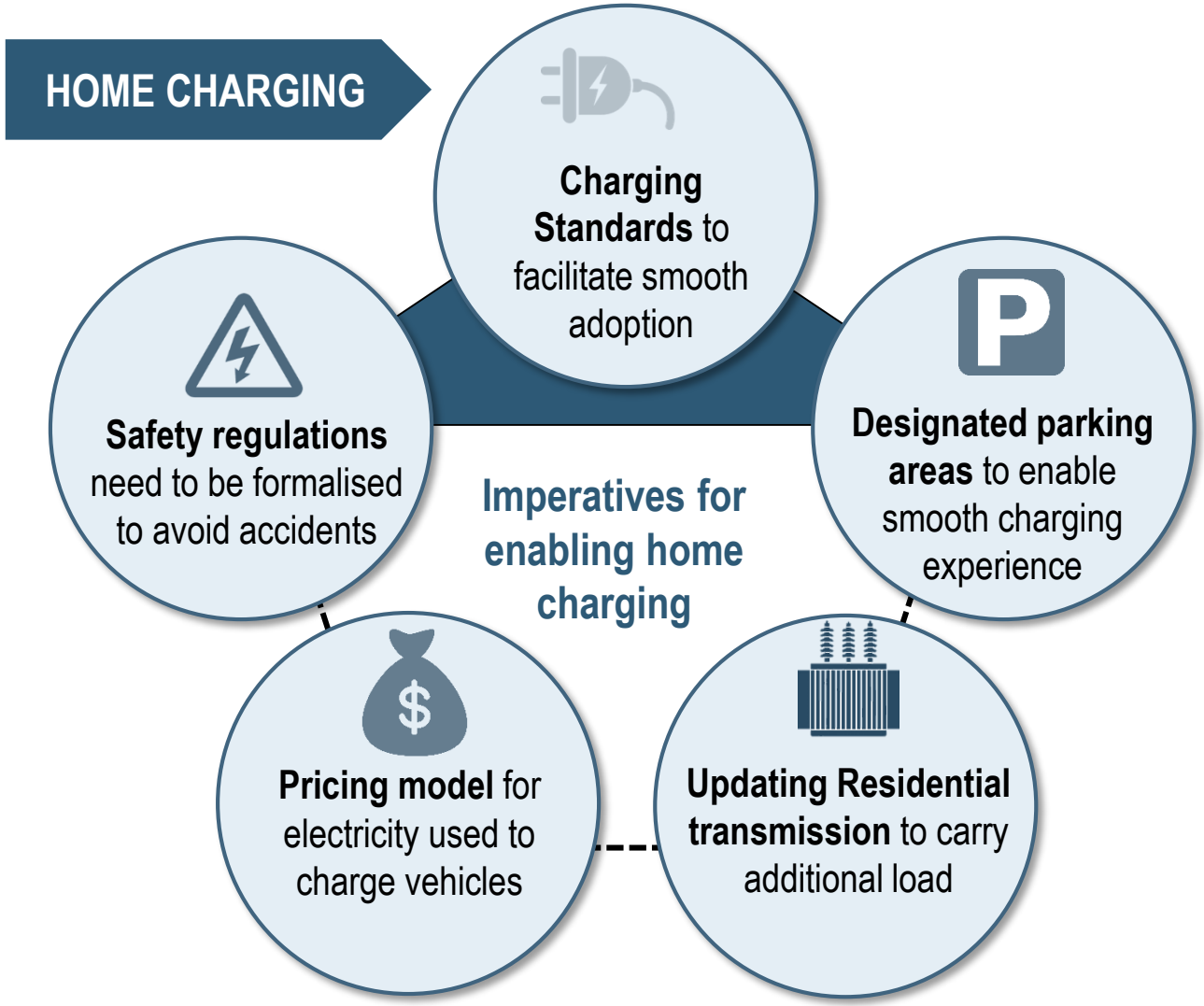

**ESTIMATED CAPITAL COST FOR PLANT: ~USD 234 Mn**

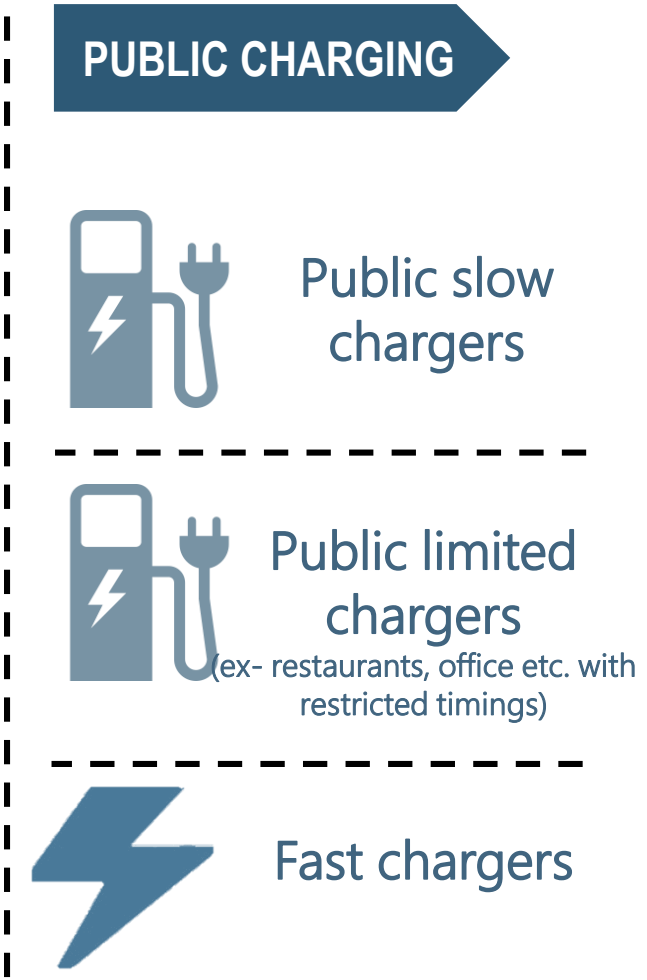
- *For manufacturing 1,00,000 batteries of 30 KWH per year (30,00,000 kwh)*
- *Manufacturing cost for US standards, excluding Land & Buildings*



Source: US Dept. of Energy, NRI analysis

# A pan India charging infrastructure, consisting of home and public charging stations, will provide the necessary push to stimulate EV demand






Source: NRI analysis

# Slow and fast chargers will need to be deployed at various locations based on the usage and charging requirement

## EV charger use case:

| Duration of use | Personal | Fleet |
|---|---|---|
| **Long Duration (2-6 hrs)** | • Home<br>• Offices<br>• Shopping Malls/Complex | • Home<br>• Parking (Pvt/ Public) |
| **Short Duration (0-2hrs)** | • Offices<br>• Airport, Railway/ Metro Station<br>• Parking (Pvt/ Public), Fuel Pump<br>• Shopping Malls/Complex | • Offices, Fleet depot<br>• Airport, Railway/ Metro stations<br>• Parking (Pvt/ Public), Fuel Pump<br>• Shopping Malls/ Complex |

## EV charger deployment:

| Location | Fast charger | Slow charger |
|---|---|---|
| **Home** | | ✓ |
| **Fleet Depot** | ✓ | ✓ |
| **Office** | ✓ | ✓ |
| **Airport / Station (Rail/ Metro)** | ✓ | ✓ |
| **Shopping Malls/Complex** | ✓ | ✓ |
| **Parking places, Fuel Pumps** | ✓ | ✓ |



Source: NRI analysis

# Participation of different stakeholders will enable the creation of a viable model for charging infrastructure

## Different players in public charging station space

Government Agencies helping in setting common standards

| Electric generation and utility companies | Fuel companies | OEMs | Businesses with parking (restaurants, shopping malls etc.) | Full fledged charging station business |
|---|---|---|---|---|
| एनटीपीसी NTPC, पावरग्रिड | Bharat Petroleum, इंडियनऑयल IndianOil | MARUTI SUZUKI Way of Life!, HYUNDAI, TATA MOTORS, Mahindra, Toyota | McDonald's, DLF | SIEMENS, ABB |
| Kick starting adoption | | | Pushing adoption | Monetizing EV Penetration |

Increasing requirement of EV penetration for viability

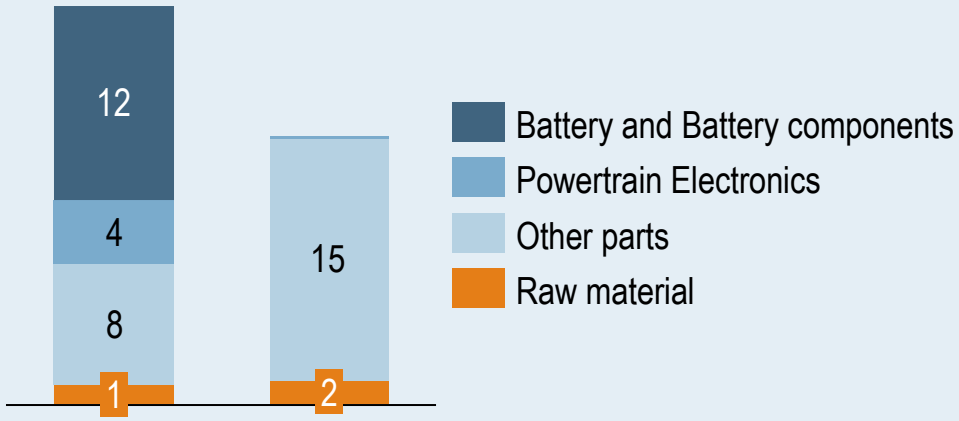


Source: NRI analysis

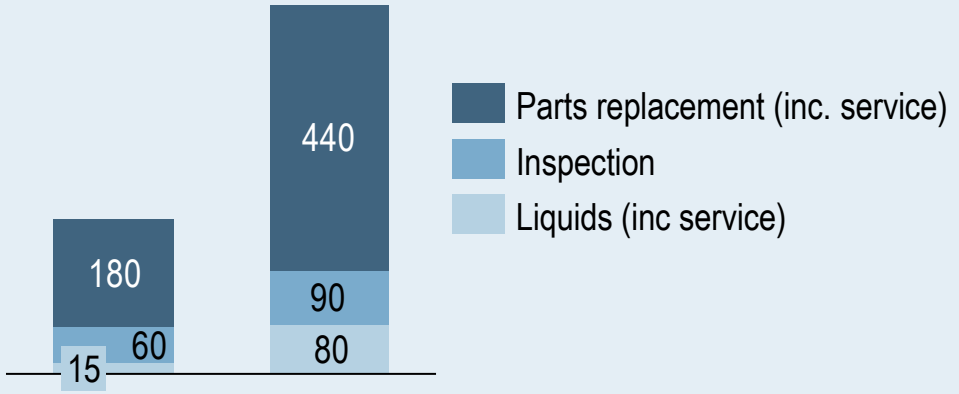
# Introduction of EVs will change the skills required in auto sector, hence a dedicated focus on skill development for a large workforce is required

## Skill upgradation of a large workforce is needed

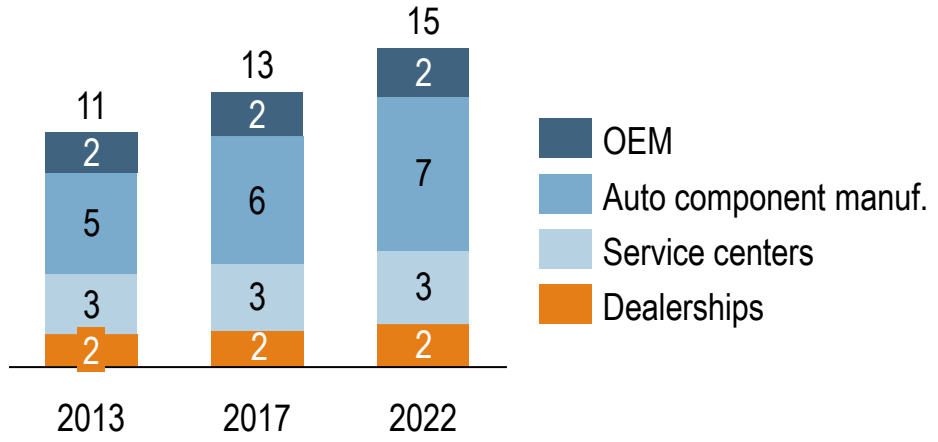
### Vehicle content – EV vs ICE (in '000 USD)




### Annual maintenance cost - EV vs ICE (in USD)




### Employment in auto sector (in million)




- Traditional **powertrain components are significantly reduced** with the introduction of EVs
- **Powertrain electronics components** are high in EVs increasing the semiconductor content of the car
- India **currently lacks suppliers and skills for new EV** components like converters / inverters
- The **spare part and service market** will also disrupt in long term because of very few moving parts in EVs leading to **low wear and tear**



Source: UBS, NSDC

# Lithium recycling is very hazardous, primarily because of highly reactive nature of Lithium ions - Improper handling can cause disasters

## Hazards in recycling Lithium batteries

### Transportation of used batteries

| Damage | Thermal Runaway | Water |
|---|---|---|
| Physical damage while transportation can cause fire | Thermal runaway is a phenomenon in which increased temperature of one cell can start a chain reaction | Seepage of water during transportation can also result in short-circuits |

### Recycling of used batteries

| Residual Charge | Toxic by-products |
|---|---|
| - Lithium batteries sometimes have residual charge<br>- This residual charge means highly active Li ions are present in the electrolyte causing fires | - The by products of smelting the Lithium batteries at high temperature are also very reactive and can cause fire |

TOXCO

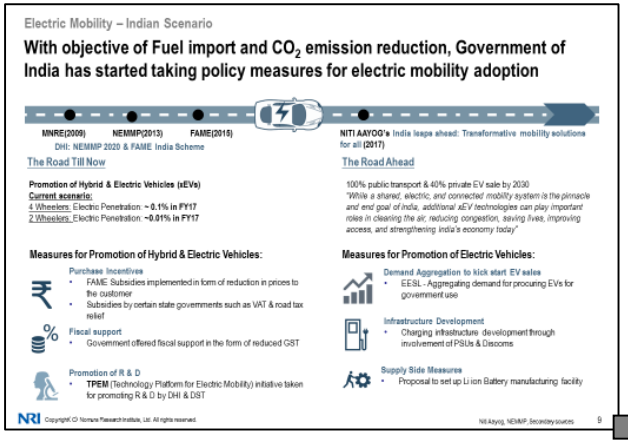
A fire in Toxco's Lithium battery recycling facility destroyed the complete storage building in British Colombia, US

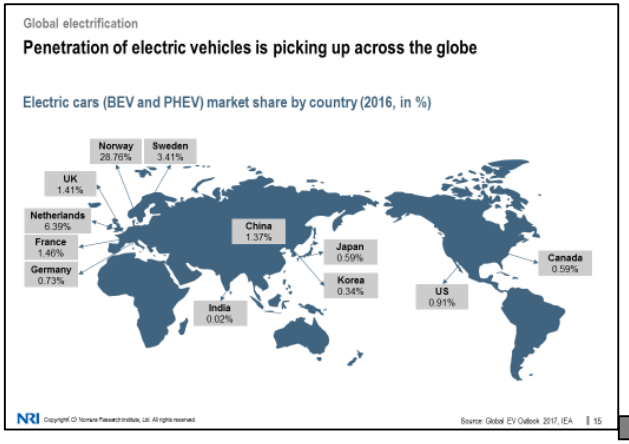


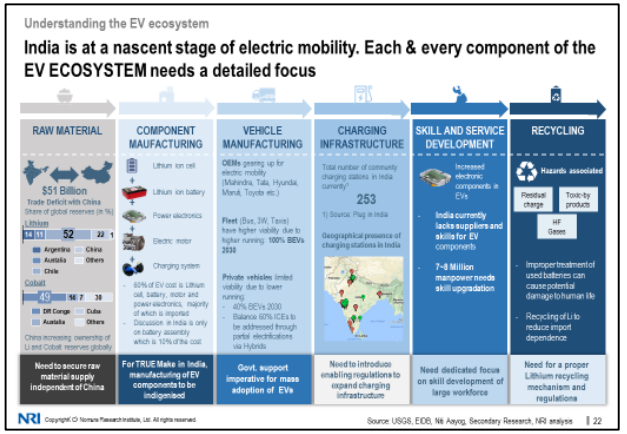
Source: Business press

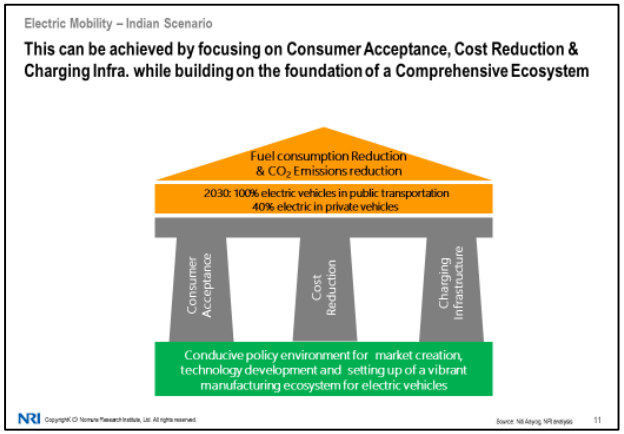
# MAKING IT HAPPEN – POLICY RECOMMENDATIONS

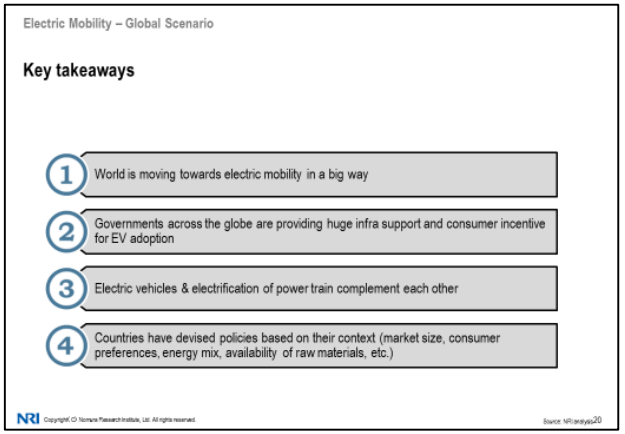
# Policy recommendation have been derived based on India's EV vision, study of Global EV developments & peculiarities of India's EV Ecosystem




**India's vision AND 3Cs needed for achieving it**

**Global learnings**

**India's EV ecosystem peculiarities**

## POLICY RECOMMENDATIONS



Source: NRI Analysis

# Fiscal incentives should be given with the aim of bringing down the initial purchase price and to reduce ownership cost (Incentives across segments)


- Favorable GST rates and duty structure for EV / HEV / PHEV for mass adoption of electric mobility
- Purchase incentive basis viability gap and efficiency for EV / HEV / PHEV adoption
- Attractive financing rates for EVs to help reduce viability gap
- Continue 200% tax benefit for R&D activities in xEV
- Export Incentives to manufacturers for making India a hub for EV manufacturing



Source: NRI Analysis

# Non-fiscal incentives should aim at promoting an overall EV environment by making their use preferential and easy


- Unique Number Plates (Green plates) for easy identification of Electric Vehicles
- Bulk insurance by government for bus fleets to improve adoption
- Single commercial permit for incentivizing private operators to switch to electric
- Reduced fees for parking and toll charges to promote electric vehicle adoption
- Increase validity of fitness certificate for commercial electric vehicles



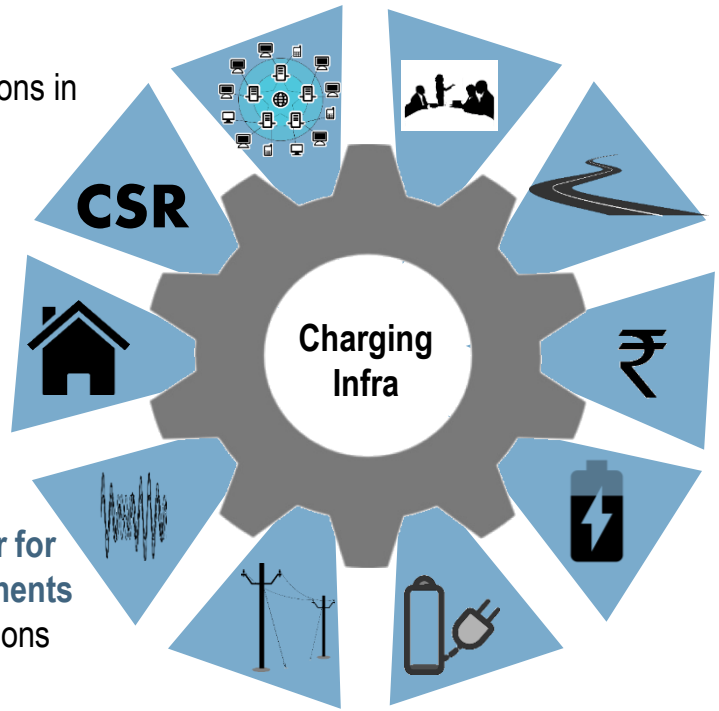
Source: NRI Analysis

# Several policy aspects need to be focussed on for creating a viable and convenient Charging Infrastructure

**Interconnected IT network** used by end consumers, utility companies, charging infrastructure providers, etc. viz. Location of different type of chargers, availability of chargers, tariffs, payment, etc.

**Forum of policy makers**, auto industry, energy cos, power generating & distribution cos & others to frame policy for **nationwide network of charging stations**

To encourage cos to install charging stations in their premises, such **spending may be considered under CSR.**




A clear roadmap with defined milestones for **setting up charging infrastructure** at City, State and at National level

Regulations (including **amendment of Building bye laws)** to mandate **AC slow charging & DC fast charging points** in buildings, homes, etc.

To make EVs viable, a **reduced electricity tariff scheme** need to be introduced in all states and union territories, as has been done in case of Delhi.

Guidelines on availability of **stable power for EV charging, to ensure critical components are not damaged** due to voltage fluctuations

**Charging standards** for different vehicle segments should be notified

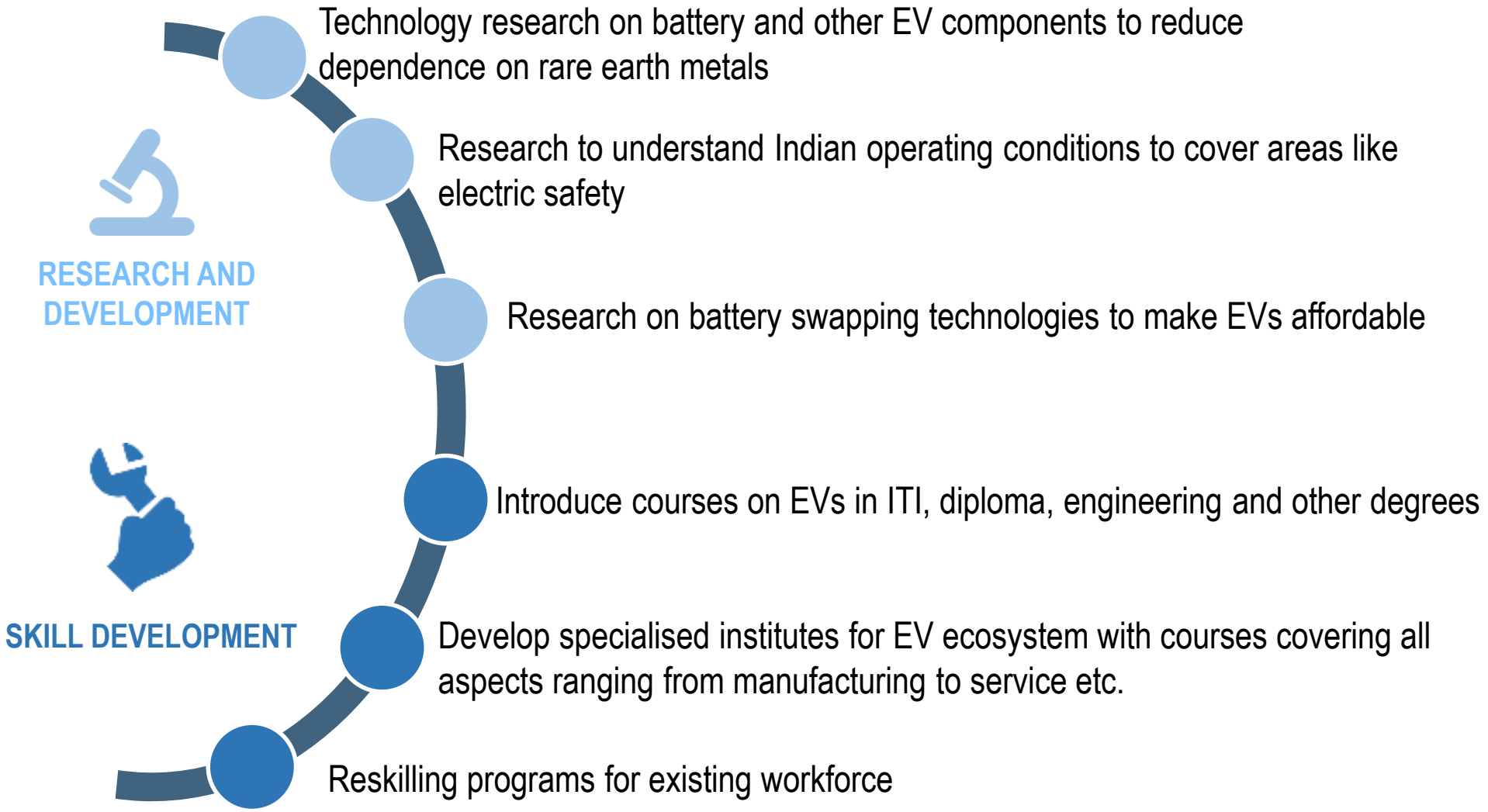
Most EVs will be charged at night in homes/ parking spaces - load on **grid will be high at night, requiring capacity enhancement by discoms**

Similar to Fuel supply by PSUs / private players, charging infrastructure once set up, **electricity should be provided by PSUs/ private players**.



Source: NRI Analysis

# Policy measures are needed to make sure that India develops its own R&D capabilities in EV ecosystem and also reskill its valuable workforce






Source: NRI Analysis

# Policy incentives are needed for development of a vibrant Manufacturing Ecosystem and Battery Recycling infrastructure

**MANUFACTURING ECOSYSTEM**

Tax breaks and incentives for capital expenditure and raw materials

Phase wise graded import duty structure to ensure growth of domestic manufacturing of EV components and batteries
(e.g. lower import duty in short term and graded increase in the long term)

Incentives to promote export of EV components from India

**BATTERY RECYCLING & REUSE**

Encouraging companies to develop battery recycling eco system

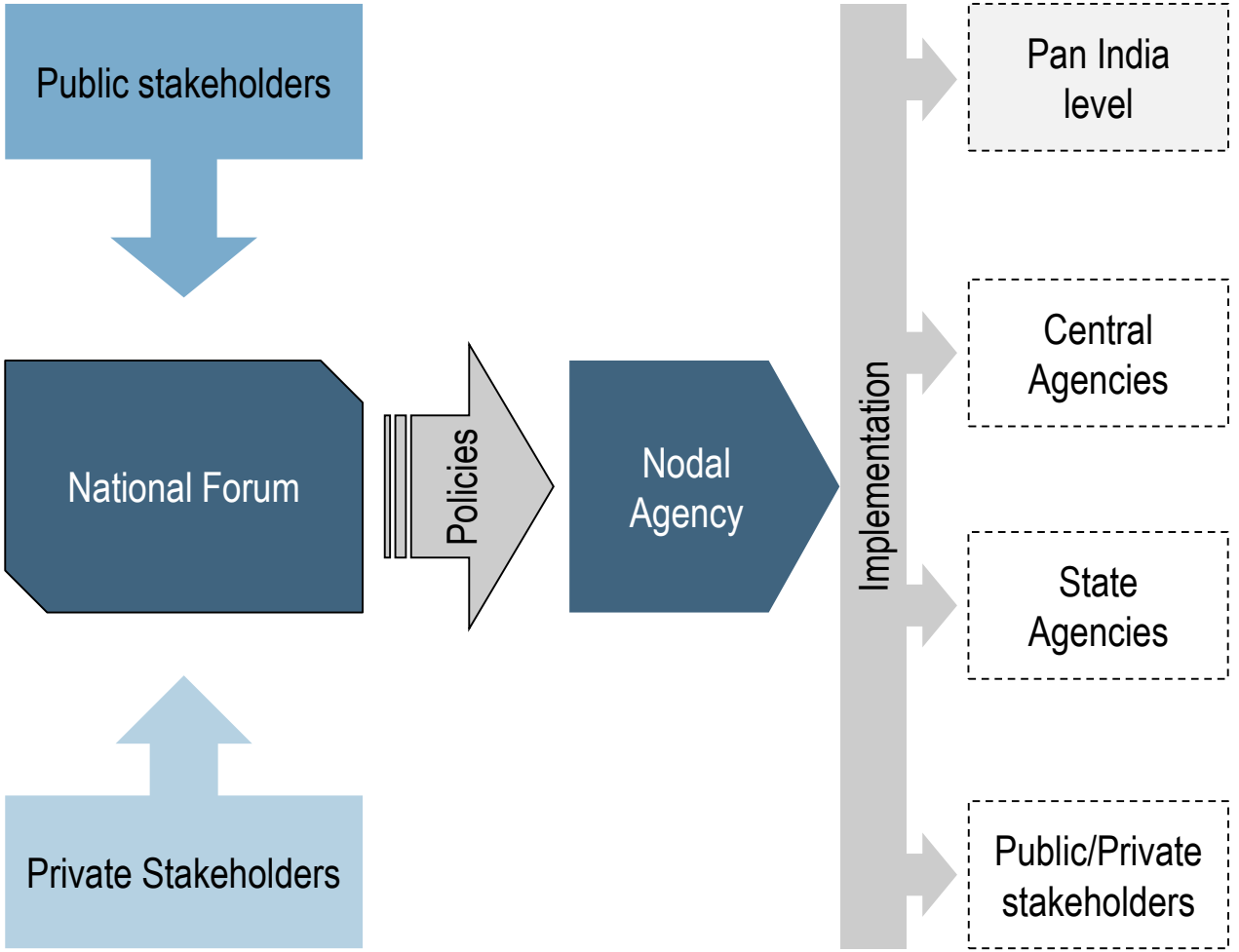
Tax breaks and fiscal incentives for setting up of recycling facilities

Encourage reuse of old EV batteries in stationary applications



Source: NRI Analysis

# Establish National EV Forum for making policies involving various stakeholders & for continuous dialogue with the industry




- To ensure a smooth transformation, it is necessary to **establish a National Forum for policy making & implementation**
- The forum should have representatives from auto OEMs, auto suppliers, Govt. bodies overlooking the EV transformation, service providers delivering supporting infrastructure e.g. power discoms, suppliers for parts for EVs e.g. batteries & academia
- Need to have a **continuous dialogue with the industry** to regularly discuss the progress & corrective actions

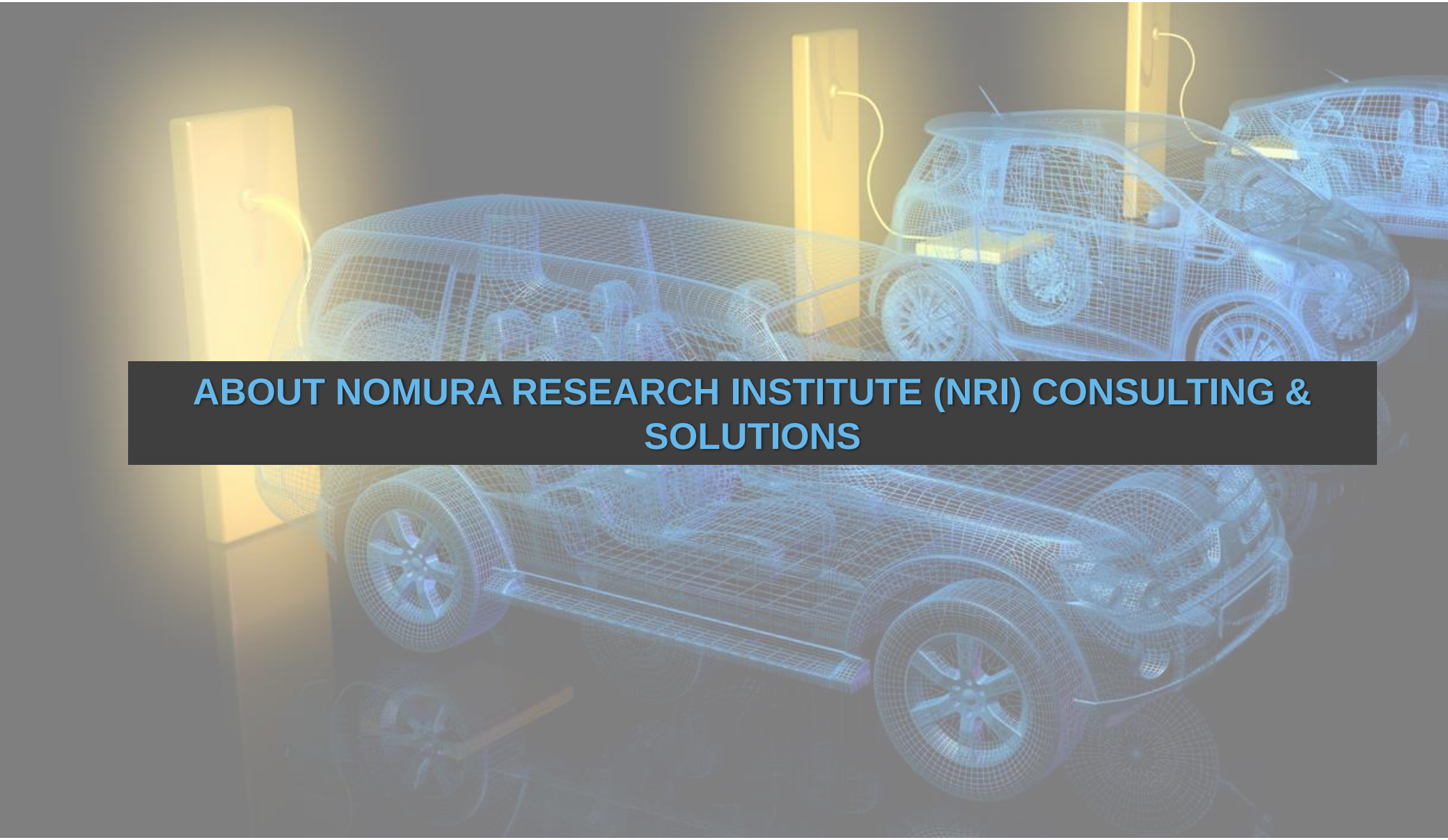


Source: NRI Analysis

# Assocham can provide valuable support in helping the nation achieve the e-mobility mission

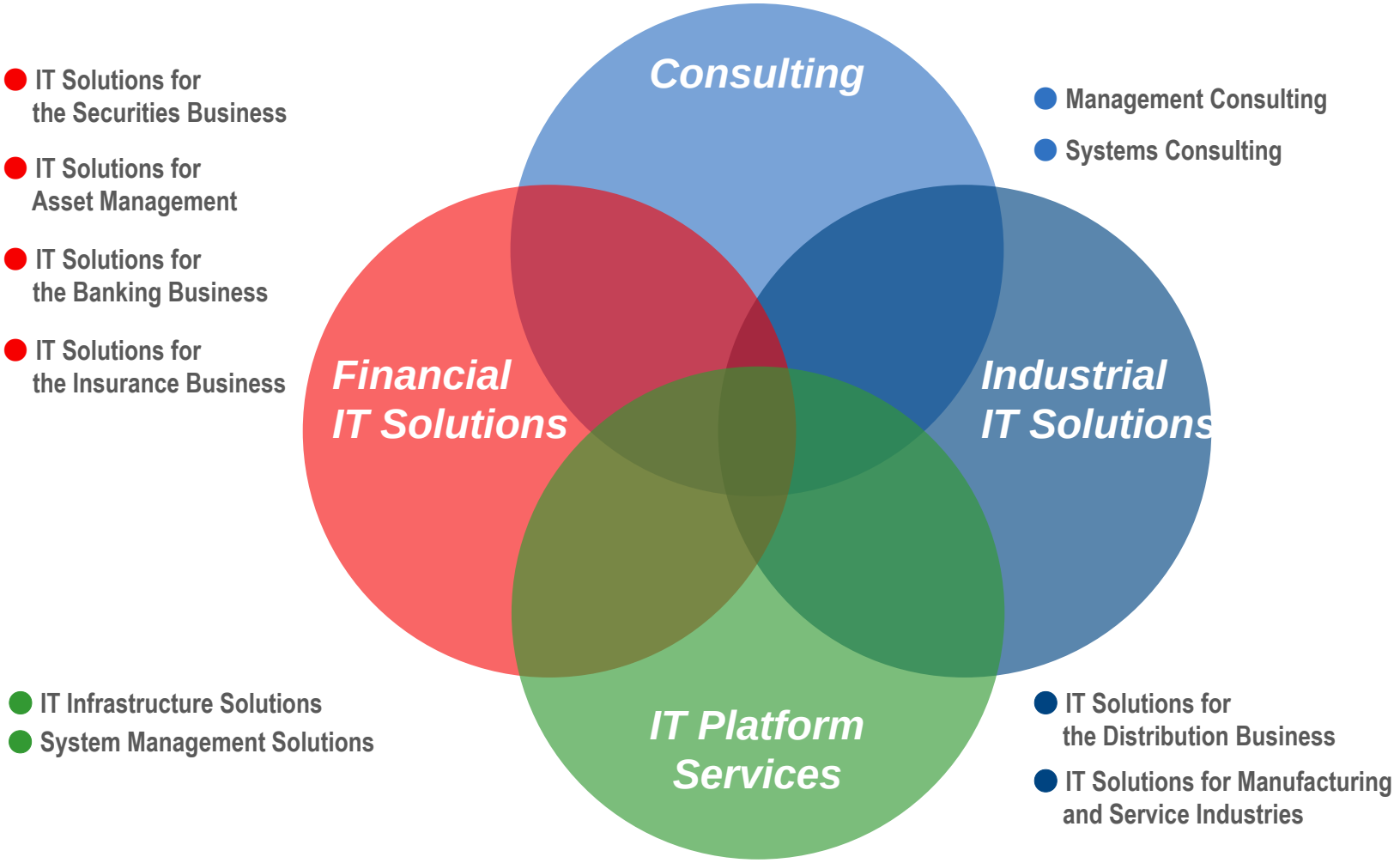
ASSOCHAM INDIA

1. Facilitate development of start-up ecosystem for Electric Mobility
2. Help integrate non-traditional automotive value chain players e.g. charging station developers into the EV value chain
3. Play an active role in bringing together Indian and overseas companies by means of technical tie-ups, JVs, etc.
4. Coordinate between industry and government by developing a collaborative platform



# ABOUT NOMURA RESEARCH INSTITUTE (NRI) CONSULTING & SOLUTIONS

# NRI Consulting & Solutions (part of the USD 4 bn NRI group) is a premier global management consulting and IT solutions firm headquartered in Japan






Source: NRI

# NRI Consulting team works closely with clients to help achieve more success by superior strategy development & business performance improvement

## Business Strategy and Optimization

- *Business strategy development*
- *Internal & external positioning*
- *Business modelling*
- *Implementation planning*
- *M&A advisory*
- *Cost optimization*
- *Organizational development*
- *Benchmarking programs*

| Sales | Service, Spares | Products & Technology | Supply Chain | Procurement & Ops |
|---|---|---|---|---|
| *Sales strategy and growth development*<br>*Dealer development*<br>*Customer penetration and shares of wallet*<br>*Sales organization*<br>*SOP & process optimization* | *Service portfolio alignment*<br>*Service process optimization*<br>*Spare parts logistics and service levels*<br>*Product line and service unit interface optimization* | *Product portfolio planning*<br>*Technology roadmaps*<br>*Product cost optimization*<br>*Variant, configuration and change management*<br>*Engineering excellence*<br>*ESO* | *Supply chain performance measurement*<br>*Supply chain strategy und network improvements*<br>*Working capital improvement*<br>*Logistics optimization*<br>*Warehousing improvements* | *Supplier management and development*<br>*Material cost reduction*<br>*Capex optimization*<br>*Advanced cost modeling*<br>*Supplier innovation management*<br>*Operations improvement* |

**Top-line impact** → **Bottom-line impact**



Source: NRI

# We look forward to supporting the industry in these VUCA times

From Negative (-) → To Positive (+)

| | |
|---|---|
| V Volatility | V Vision |
| U Uncertainty | U Understanding |
| C Complexity | C Clarity |
| A Ambiguity | A Action |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# NOTES


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