

Automotive regulations in FY23 ACMA

July 2023



Regulatory scenario in FY23 has evolved on 3 key automotive trends gaining traction globally

Regulation domain

Regulation overview

1 Safety

- **Bharat NCAP rating system** – Crash test assessment for ICE, CNG and EV in M1 category
- **Six airbags** – Mandatory from 1st Oct, 2023 for M1 category
- **Rear seat belt reminder** – Draft rules published making it mandatory for M and N category vehicles
- **Driver Drowsiness and Attention Warning System (DDAW)** – Draft released for M and N category vehicles

2 Emissions

- **Constant Speed Fuel Consumption (CSFC) testing** – Measures fuel consumption under steady state; Applicable for M and N category vehicles with GVW>3.5 T from 1st Apr, 2023
- **Global Standards** – Vehicular emission standards globally
- **Carbon Credit Trading Scheme** – Notification for trading of carbon credits and various stakeholders outlined by government

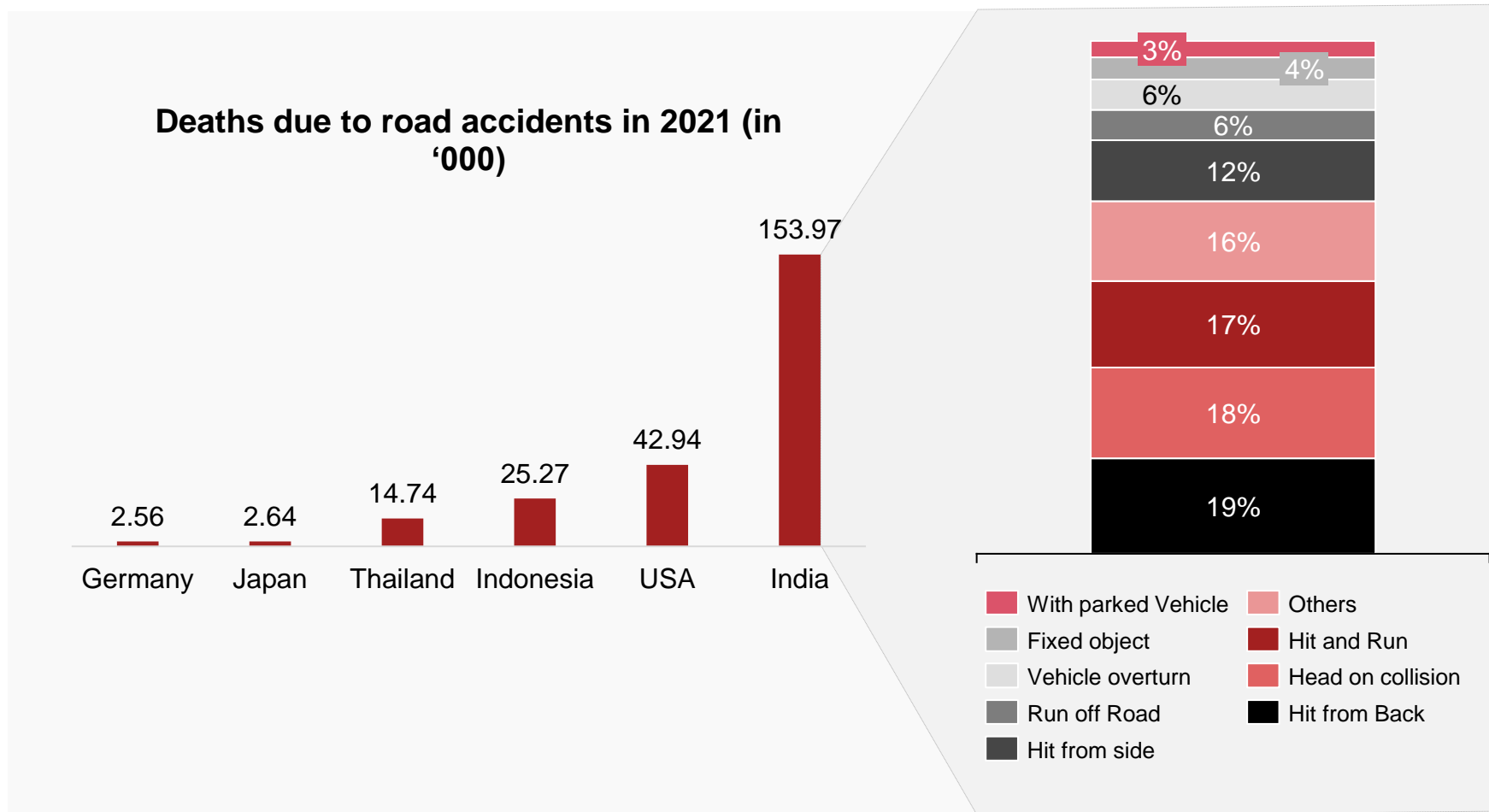
3 Alternate Powertrains

- **Regulation: National Green Hydrogen Mission** – Using H2 as a fuel source and develop domestic renewable H2 production capacity of 5 MMT/year by 2030
- **Regulation: Amendment 2 to AIS038** – Safety & Performance Standards for EV (M & N category)
- **Regulation: Amendment 3 to AIS156** – Safety & Performance Standards for EV (L category)
- **Regulation: Custom duty revision for EV** – Reduction of custom duty in Li-ion battery imports and cell manufacturing
- **Policy: State EV policy revision**

Safety

Bharat NCAP (Draft Stage)

India is one of the least safe countries in road transportation



Observations

- Every year, **approximately 1.5 lakh people die on Indian roads**
- India has **one of the world's worst accident records**
- **India aims to reduce road accidents and deaths by 50 percent by 2030**

Bharat NCAP is a safety assessment program similar to global NCAP

What is Bharat New Car Assessment Program (NCAP)



Automobiles will be accorded **star ratings** based on their **performance in crash tests** factoring in the existing Indian regulations and driving conditions



- To ensure structural and passenger **safety**
- To increase the **export-worthiness** of Indian automobiles



First announced in 2016, **likely to be implemented from 1st October 2023** after the **mandatory review** of 30 days which ends on 31st August 2023



Cars and SUVs with up to **8 seats** (M1 category vehicles) weighing **under 3.5 tonnes**, including CNG and EV

Bharat NCAP VS Global NCAP

- Bharat NCAP's** test uses **50 km/hr** in its side impact test unlike **Global NCAP's 64 km/hr**
- Bharat NCAP** provides **standardized rating** which combines crash test results for AOP and COP and another for SAT whereas **Global NCAP gives separate ratings** for adult and child protection

Tests performed and the distribution of assessment points under Bharat NCAP

Sr No.	Group	Test performed	Assessment Points	Assessment Points
A	Adult Occupant Protection (AOP)	Offset Deformable Barrier Frontal Impact Test	16	32
		Side Impact Test	16	
		Pole Side Impact Test	Qualifier for 5-Star	
B	Child Occupant Protection (COP)	Offset Deformable Barrier Frontal Impact Test	16	49
		Side Impact Test	8	
		CRS Installation Checks	12	
		Vehicle based assessments	13	
C	Safety Assist Technologies (SAT)	Electronic Stability Control	As qualified	
		Pedestrian Protection		
		Pole Side Impact		
		Side Head Protection		
		Seat Belt Reminders		

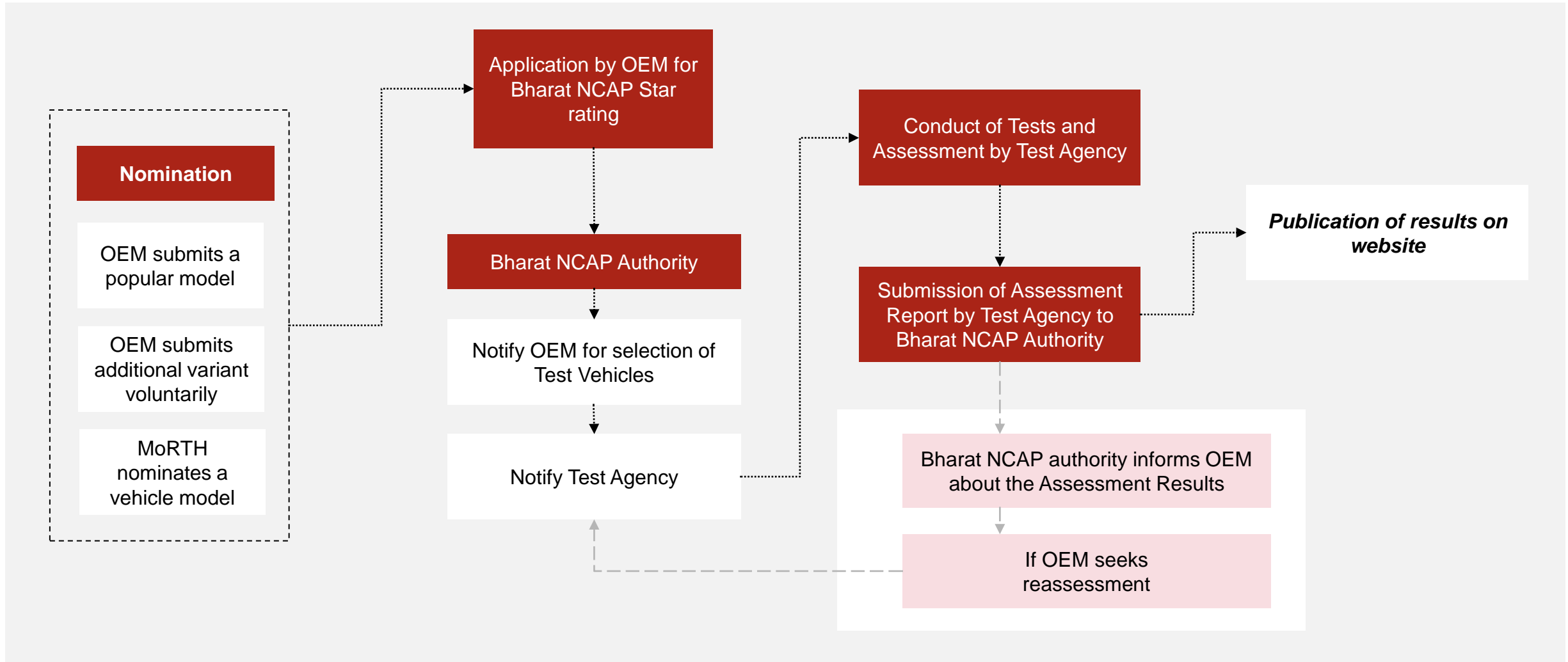
Minimum qualifying scores for star rating

Stars	Minimum qualifying score for AOP	Minimum qualifying score for COP	Minimum qualifying score for SAT
☆☆☆☆☆	27	41	As qualified
☆☆☆☆	22	35	
☆☆☆	16	27	
☆☆	10	18	
☆	4	9	

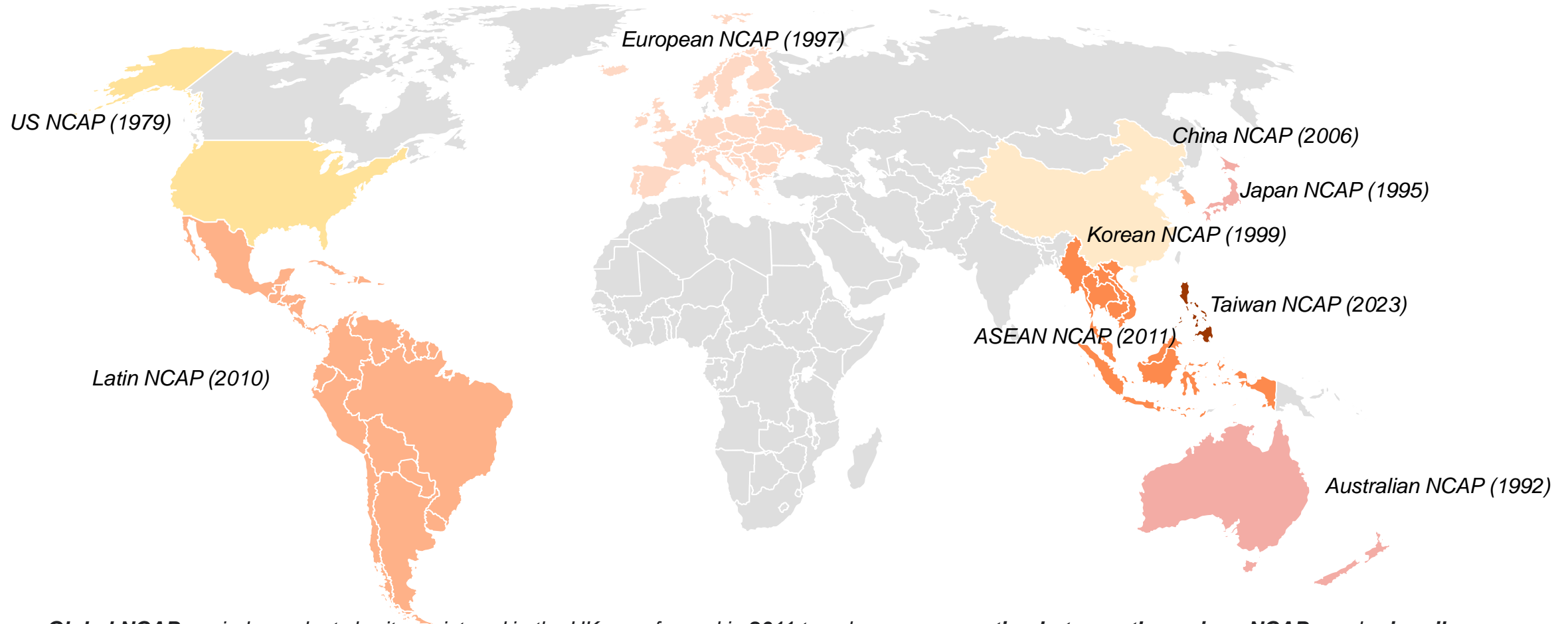
Tests included in the 'Safer Cars For India' campaign by Global NCAP

All other tests are also a part of Global NCAP

Government has defined the nomination and testing process for Bharat NCAP for OEMs

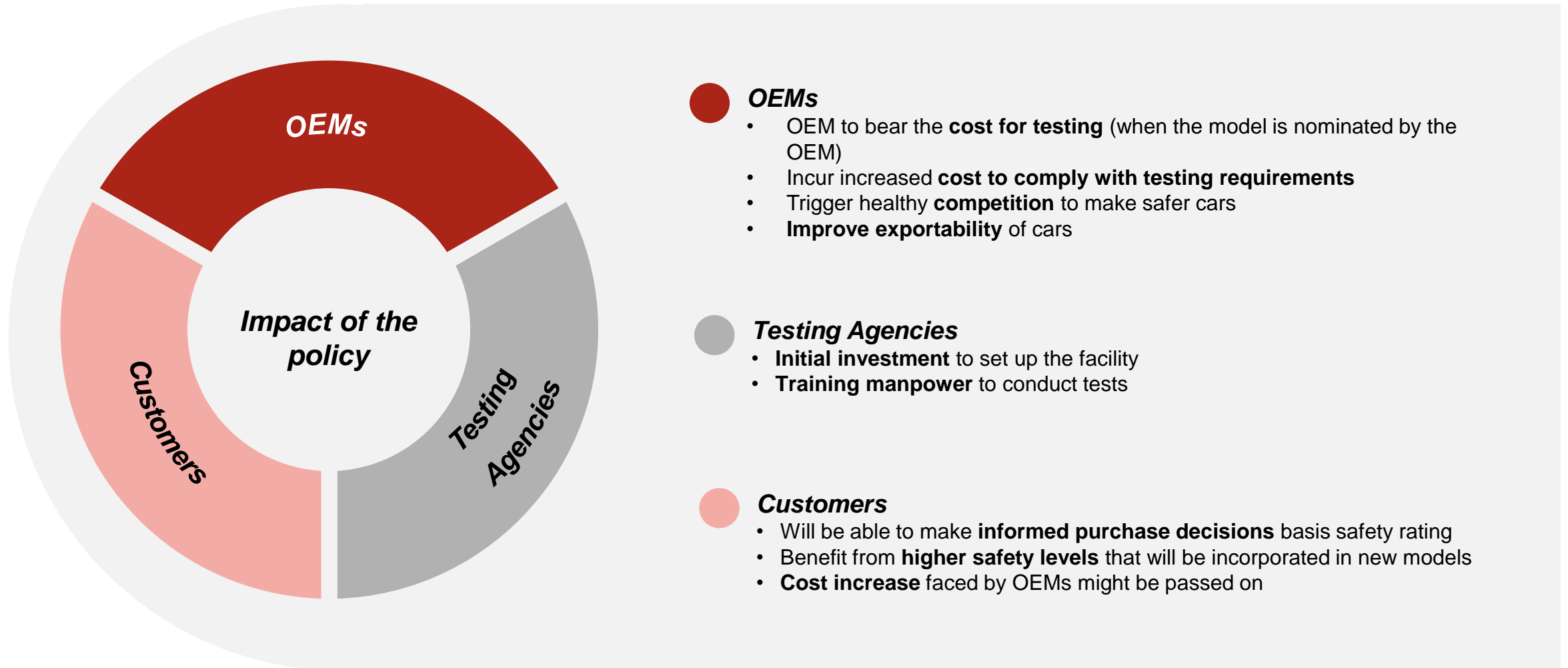


US, EU and Japan were the global automotive manufacturing geographies that had set up NCAP guidelines early



- **Global NCAP**, an independent charity registered in the UK, was formed in **2011** to enhance **cooperation between the various NCAPs** and **primarily promote vehicle crash-testing and reporting in emerging markets**
- **Safer Cars for India and Africa** are two campaigns being run by Global NCAP

NCAP ratings will have cost implications for OEMs and Customers



Safety

Six Airbags Regulation

(Draft stage)

Expected to be included under Bharat NCAP

Safety features are becoming increasingly important in India with the surge in road traffic

Road transport statistics tell us...

19,488 persons were killed in car accidents in India (2021)

72% deaths were in collision with 4W and above

84% deaths were due to non-use of safety devices

Source: Ministry of Road, Transport & Highways

...while in the past decade

250%

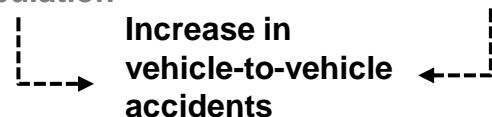


Vehicle Population

50%



Road Network



Source: Ministry of Road, Transport & Highways

Need for safety measures to be taken up is of paramount importance

1

Increase in highway network

- Highway network in India has expanded by 48% in India between FY15 and FY23
- National Highway are 2.1% of the overall road network but account for 31% of overall accidents

2

Increase in vehicle population

- PV sales in India touched record high in FY23 (3.6 Mn) and they are expected to grow further y-o-y
- Vehicle population in India will grow by 10-15% by 2030

3

Limited OEM push

- India being cost-sensitive market, roughly 50% cars sold are priced less than 10 lakhs
- Only 17% cars sold in FY23 had 6 airbags feature; none of those variants were priced below 10 lakhs

Regulatory push towards mandatory airbags has opened up opportunities for component manufacturers

Regulations

Timeline*

*For vehicle in M1 category – seating 8 people or less

Number of airbags

Cost per vehicle (INR)

(for OEMs)

Domestic demand for airbags (Units)

	Driver airbag mandatory <i>July, 2019</i>	Dual airbags mandatory <i>Jan, 2022</i>	Six airbags (Draft Stage) <i>Oct, 2023</i>
Number of airbags	1	2	6
Cost per vehicle (INR)	2000-3000	3000-4000	8000-10000
Domestic demand for airbags (Units)	3 Million	6 Million	18 Million

As per ACMA, current airbag manufacturing capacity in India is 22.7 million. It is slated to increase to 37.2 million next year (Dec'22)

Airbag system is listed as one of the 24 advanced automotive technologies to receive manufacturing incentive under Production Linked Incentive (PLI) scheme. Components incentivised are Inflator, Crash detection sensor & Airbag Control Unit (ACU).

Deployment of airbag as a safety standard differs between economies necessitating a regulatory push in few

Developing economies

Average airbags per vehicle less; safety standards require regulatory push with OEM effort

Developed economies

Average airbags per vehicle more; safety standards enabled largely by OEM efforts alone











Geography	Regulation
India	6 airbags mandatory
China	Frontal airbags mandatory
Thailand	No rule
Indonesia	No rule
Argentina	Frontal airbags mandatory
South Africa	No rule
Russia	Regulation lifted*
Brazil	Frontal airbags mandatory
USA	Frontal airbags mandatory
EU	No rule
Germany	No rule
Canada	No rule
Australia	No rule
Japan	No rule
UAE	Frontal airbags mandatory

India is the first country globally to mandate 6 airbags

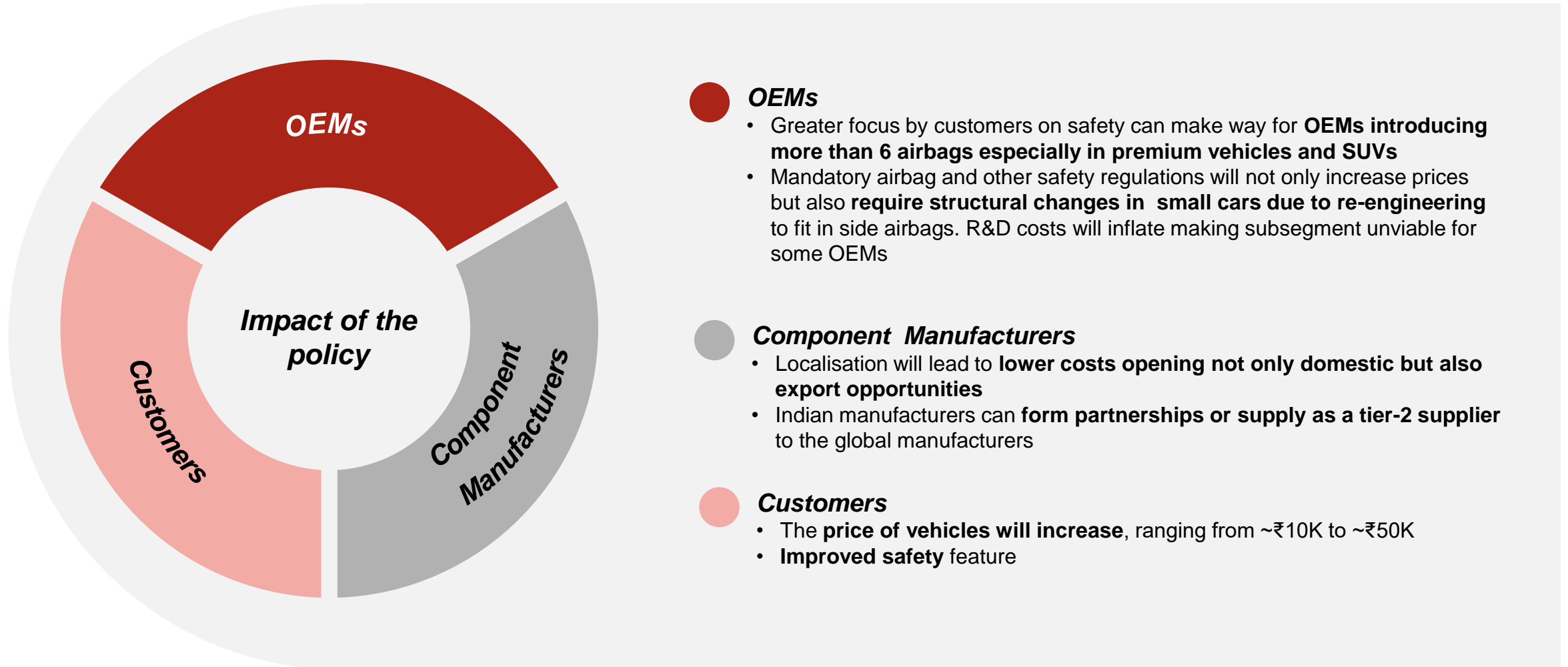
US was the first country globally to mandate frontal airbags in 1998

Nearly 100% cars in EU are equipped with frontal airbags as a safety standard despite not being mandatory

Localization in airbag manufacturing is set to undergo drastic improvement as industry leaders develop domestic capabilities

Parts	Airbag Module 	Crash Detection Sensor 	Airbag Control Unit 
Function	<p>Propellant: Solid chemical (Guanidium Nitrate) which generates Nitrogen gas by burning</p> <p>Inflator: Transfers generated gas (Nitrogen) to airbag</p> <p>Airbag fabric: Cushions impact by inflating; made of Nylon fabric</p>	<p>Front impact sensor: These get alerted by sudden deceleration and send signals to supplemental restraint system (SRS)</p> <p>Side impact sensor: These measure pressure changes in doors and send collision signal to SRS</p>	<p>Airbag control unit: Utilising information supplied by sensors, it detects and evaluates the severity of accident and triggers actuators which will inflate the airbags</p>
Cost share (%)	40%	15%	45%
Localization	Low	Low	Low
Industry participants (in India)	    		

Six airbag system will have implications for all 3 stakeholders – OEMs, Customers and Component Manufacturers



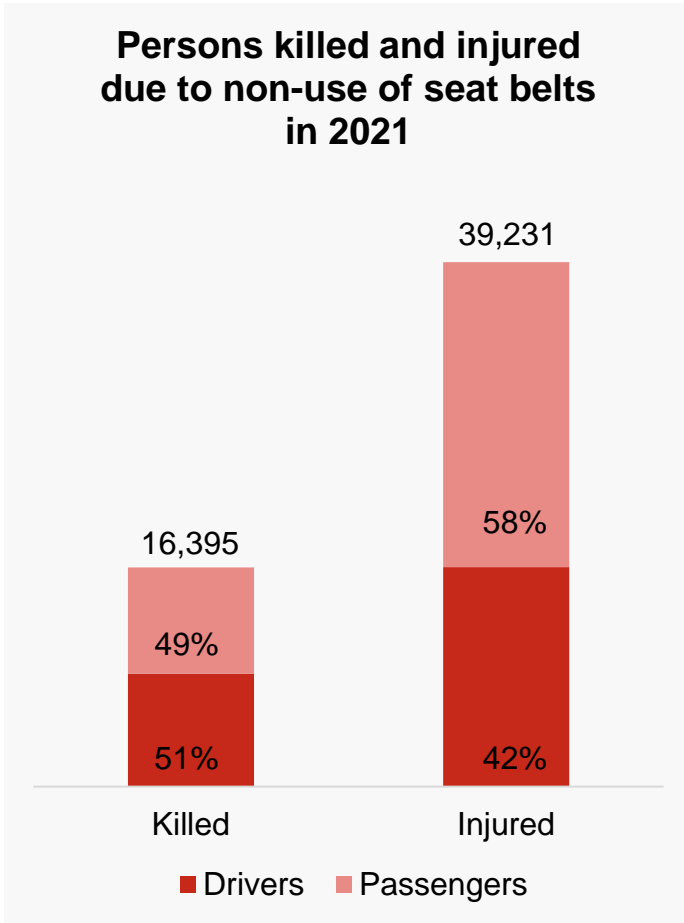
Safety

Rear Seat Belt Reminder

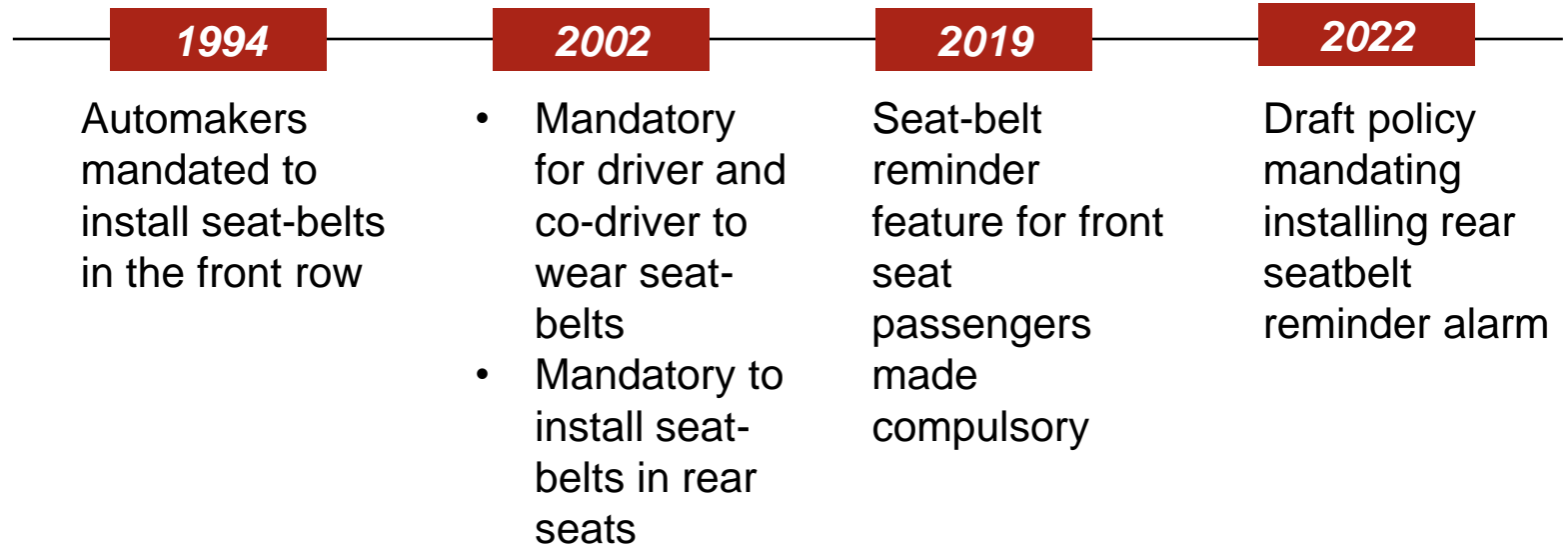
(Draft stage)

Expected to be included under Bharat NCAP

Passenger safety is being prioritized by replacing the norm for “driver and co-driver safety belt reminder” with “*driver and all other front facing seat occupants' safety belt reminder*”



Timeline for regulations in India



Effective April 2023, government made it mandatory for automakers to provide three-point seat belts for all front-facing passengers in a car

Effective November 2022, Delhi, Mumbai, and Karnataka have mandated wearing rear seat-belts, failing which a fine of INR 1,000 is being imposed

Regulatory push would open opportunities for the players in the market

Applicability

M & N category of vehicles

- M category vehicle - a motor vehicle with at least four wheels used for the carrying passengers
- N category vehicle - motor vehicles having at least four wheels used for the carrying goods which may also carry persons in addition to the goods subject to conditions

What does the policy imply?

First and Second level warning system

Visual alert (audio-visual for second level warning) when the ignition switch is turned on (vehicle is operated in the latter case) and the seat-belts of rear passengers are not buckled

All the passenger vehicles in the Indian market are equipped with seat belt reminder systems for driver and co-driver, the policy extends the mandate for rear seat passengers as well

Market scenario

- Currently, only front seats and two rear seats in most cars come equipped with three-point seat belts. **Rear middle seats come with two-point or lap seat belts**
- The government has presented a proposal to make it **mandatory** for automakers to provide **three-point seat belts** for all front-facing passengers in a car, including the **middle seat in the rear row**

Seat belt alert comprises of sensors and siren and will have an additional cost impact of ~1.5-3.5K for OEMs

Seat belt alert system senses the presence of the passenger on the seat, and if the passenger is not wearing a seat belt, it generates a continuous alarm, reminding the passenger to wear seat belt

Key components of the seat belt alert system and the estimated incremental cost:

Component	Function	Cost per seat (INR)	Cost impact
Load sensor under the seat	Detects the presence of passenger	400	5-seater ₹ 1.5-1.7K
Sensor inside the buckle of seat belt	Detects whether seat belt is buckled or not	100	
LED and icon on instrument panel	Generate visual warning	Already installed in vehicles for front passenger seats	7-seater ₹ 2.5-2.8K
Siren	Generate audio warning		
Wiring harness	To connect sensors and warning actuators to the vehicle's controller systems	32	8-seater ₹ 3-3.5 K






Cost of Assembly of INR 5/seat will also be incurred






Indian seat belt manufacturers

- Rane Holdings Ltd
- Autoliv India Pvt. Ltd.
- Joyson Anand Abhishek Safety Systems
- Abhishek Auto Company
- Goradia Industries
- Wahi Sons Private Limited
- Aisin Automotive Haryana Pvt Ltd
- IFB Automotive Pvt Ltd
- Primex Plastics Private Limited
- Bond Safety Belts
- MG Seating Systems Pvt. Ltd.
- GW Impex Private Limited
- YSI Automotive Private Limited

With an expected CAGR of ~16% and increase in rear seat belt wearing rate, the Indian seatbelt market is expected to reach USD 14 bn

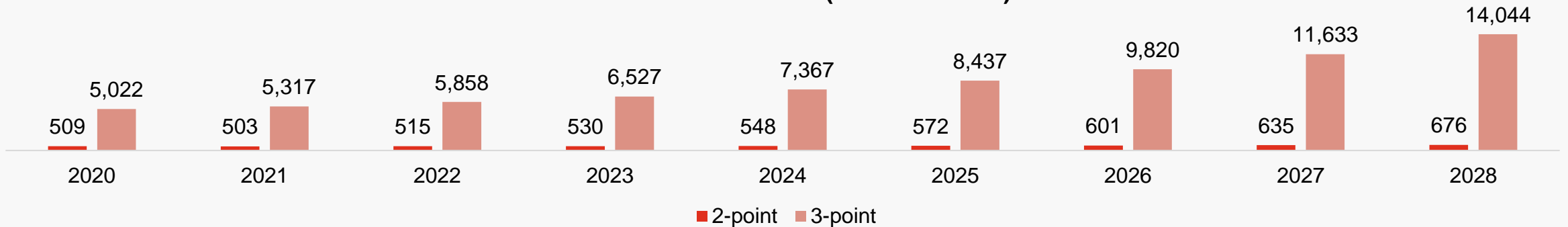
Rear seat-belt wearing rate in 2017 for top 10 countries and the year of regulation

Country	Rear seat-belt wearing rate	Year of regulation
 Germany	99%	1979
 Australia	96%	1971
 Austria	93%	1992
 New Zealand	92%	1989
 UK	92%	1991

Country	Rear seat-belt wearing rate	Year of regulation
 Sweden	90%	1986
 Canada	89%	1976
 France	88%	1990
 Switzerland	86%	1994
 Finland	85%	1987

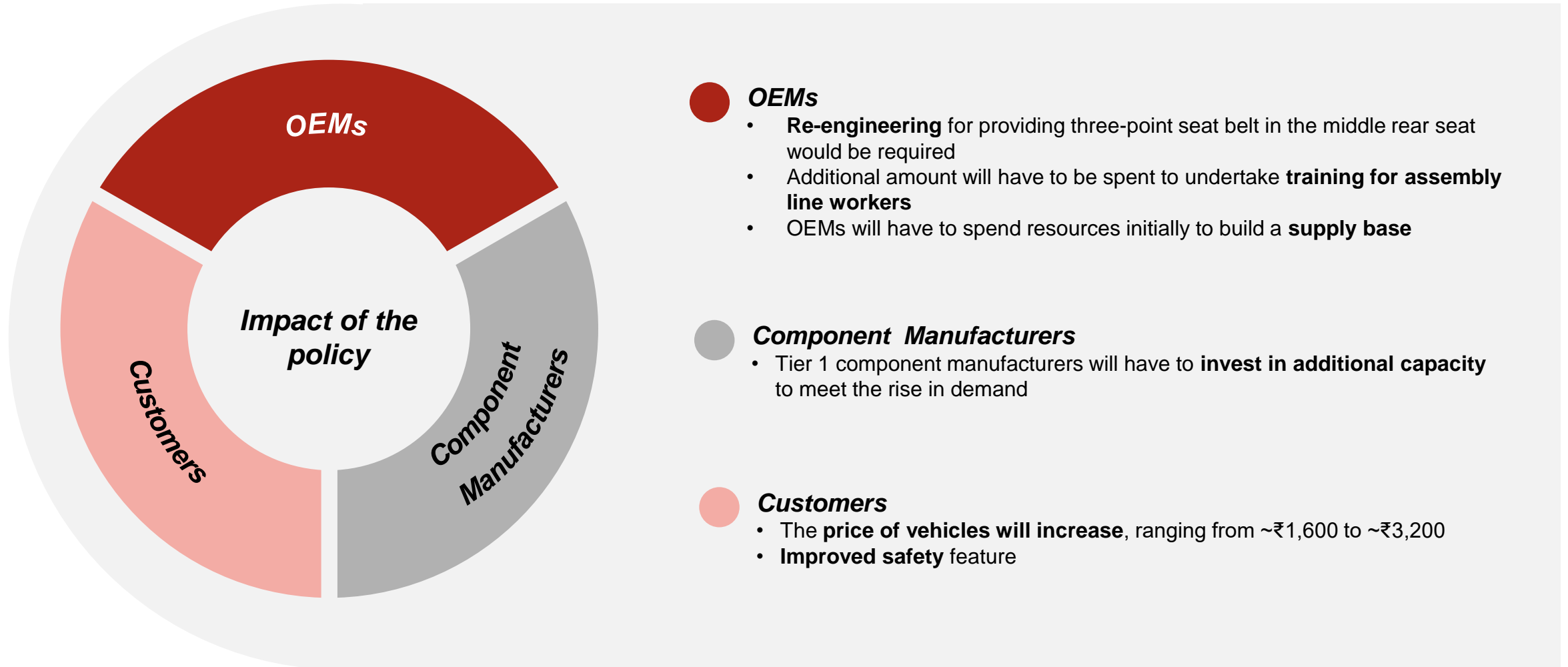
Source: WHO, Global Health Observatory data repository

Indian seatbelt market (in USD million)



Source: Desk Research, PwC Analysis
Automotive Regulations in FY23 | ACMA
PwC

Seat belt alert system will have implications for all 3 stakeholders – OEMs, Customers and Component Manufacturers



Safety

Driver Drowsiness and Attention Warning System (Draft stage)

Safety features are becoming increasingly important in India with the surge in road traffic

Road transport statistics tell us...

Nearly 10% of road accidents happened between 12 am – 6 am (2021)

Source: Ministry of Road, Transport & Highways

It is understood that for the accidents in this duration, a major reason is driver drowsiness or sleep

While truck driver surveys have revealed

12

Hours of driving per day on average covering ~400 KM

50%

Drivers admitted that they drive even when tired and sleepy

Source: SaveLIFE Foundation, M&M

Need for safety measures to be taken up is of paramount importance

1

Increase in highway network

- Highway network in India has expanded by 48% in India between FY15 and FY23
- Major drowsiness related accidents happen on highways and rural roads

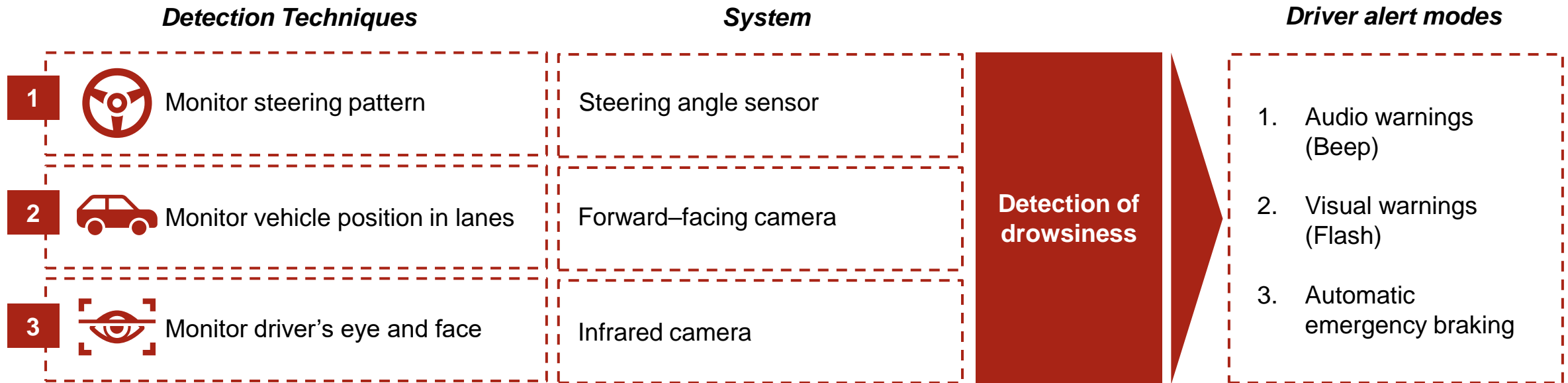
2

Increase in vehicle population

- PV sales in India touched record high in FY23 (3.6 Mn) and they are expected to at 5-7% CAGR till 2028
- CV sales in India will grow by 8-10% CAGR by 2028

Driver Drowsiness and Attention Warning System (DDAW) tracks movements to alert driver in case of any aberration

Driver Drowsiness and Attention Warning System (DDAW) is an ADAS warning system that monitors driver's and vehicle's movements for signs of drowsiness or distraction.



Draft for DDAW regulation is released and is applicable to PVs and CVs aligning closely with EU's regulation

Regulation Overview (Draft Stage)




- ▶ Applicable to M, N2 & N3 category of vehicles
- ▶ Maximum design speed above 70kmph for M1 and above 60 kmph for rest (M2, N2, N3)
- ▶ Provide a warning to driver at a level of drowsiness 8 or above
- ▶ Automatically activated on reaching minimum speed threshold

Note:
M1 – Passenger Vehicle upto 8 seats
M2 – Passenger Vehicle with more than 8 seats
N2 – Commercial Vehicle with tonnage (gross weight) between 3.5 tonnes and 12 tonnes
N3 – Commercial Vehicle with tonnage exceeding 12 tonnes
N1 – Commercial Vehicle with tonnage less than 3.5 tonnes are exempted due to limited long-haul applications





Karolinska Sleepiness Scale

Rating	Description
1	Extremely Alert
2	Very Alert
3	Alert
4	Rather Alert
5	Neither alert nor sleepy
6	Some signs of sleepiness
7	Sleepy, no effort to keep awake
8	Sleepy, some effort to keep awake
9	Very sleepy, no effort to keep awake, fighting sleep




India is 2-3 years behind EU in adoption of DDAW safety regulation

<u>Geography</u>	 EU	 USA	 INDIA
<u>Applicable date</u>	July, 2022	2027 (Proposed)	Draft released
<u>Applicable segments</u>	Passenger Vehicles, Commercial Vehicles	Passenger Motor Vehicles	Commercial Vehicles (Long haul)
<u>Inclusions</u>	Advanced driver distraction warning system		

Sensing customer shift towards increased safety features, manufacturers in India have started introducing driver safety systems

OEM	Segment/ Model	Technology Partner
	Trucks & Buses	Hi-tech Robotic Systemz Limited
	XUV700	Bosch Mobility Solutions
	Trucks	Tata Elxsi
	I20 N, Tucson	Hyundai Mobis

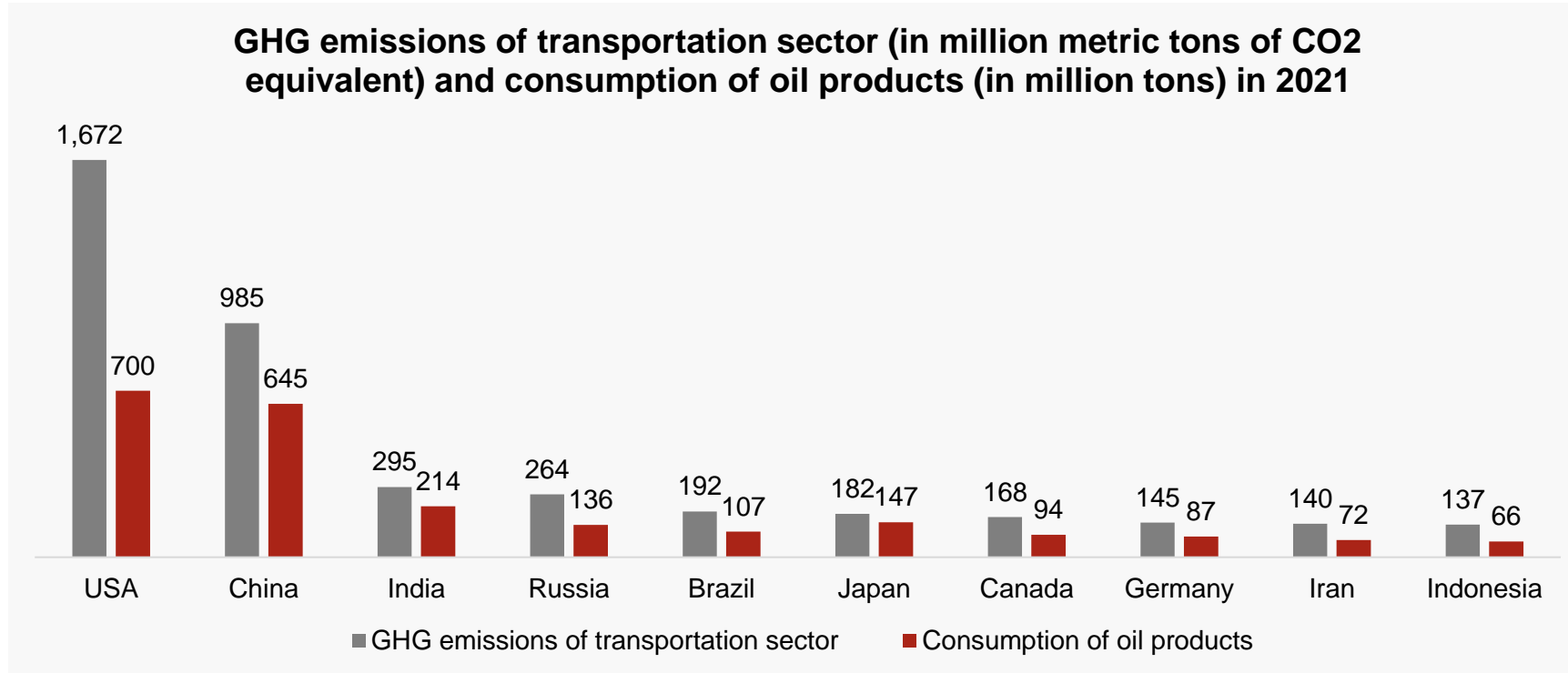
Rationale for OEMs

-  Better NCAP ratings
-  Premiumization of portfolio
-  Higher export potential

Emissions

CSFC Testing

India has 3rd highest GHG emissions in transportation sector globally and is expected to grow with increase in vehicle sales



Key insights

- The consumption of **petroleum** in India is likely to be **233.81** million metric tonnes in **FY2024***
- India's **petroleum consumption** is growing at **3%**, higher than the average **global growth rate** of around **1%**

Reducing fuel consumption and emissions is a key concern for governments and environmental organizations around the world. CSFC testing can help identify vehicles that are more fuel-efficient and have lower emissions, which can help reduce the environmental impact of transportation.

*As per the projections by the Petroleum Planning & Analysis Cell (PPAC) of the Ministry of Petroleum and Natural Gas

Source: Statista, EnerData

Automotive Regulations in FY23 | ACMA

PwC

July 2023

28

To reduce GHG emissions, govt. has introduced CSFC norm for M&HCVs to measure vehicle fuel efficiency

What is Constant Speed Fuel Consumption (CSFC)



CSFC is an important measure of a **vehicle's fuel efficiency under a steady-state condition**. It is used to determine how much fuel a vehicle consumes at a constant speed



Applicable to all **M3 and N3 category vehicles**, excluding tippers, with a gross vehicle weight **more than 12 tons**



The new norms are part of the government's efforts to promote **sustainable mobility**, reduce India's dependence on **fossil fuels**, and **reducing emissions** of vehicles on Indian roads

Timeline of the regulation in India

2015

Fuel consumption standards (FCS) were first introduced in India in 2015, with all cars and passenger vehicles (M1 category) required to comply from FY2018

1st July
2022

Draft notification issued by MoRTH

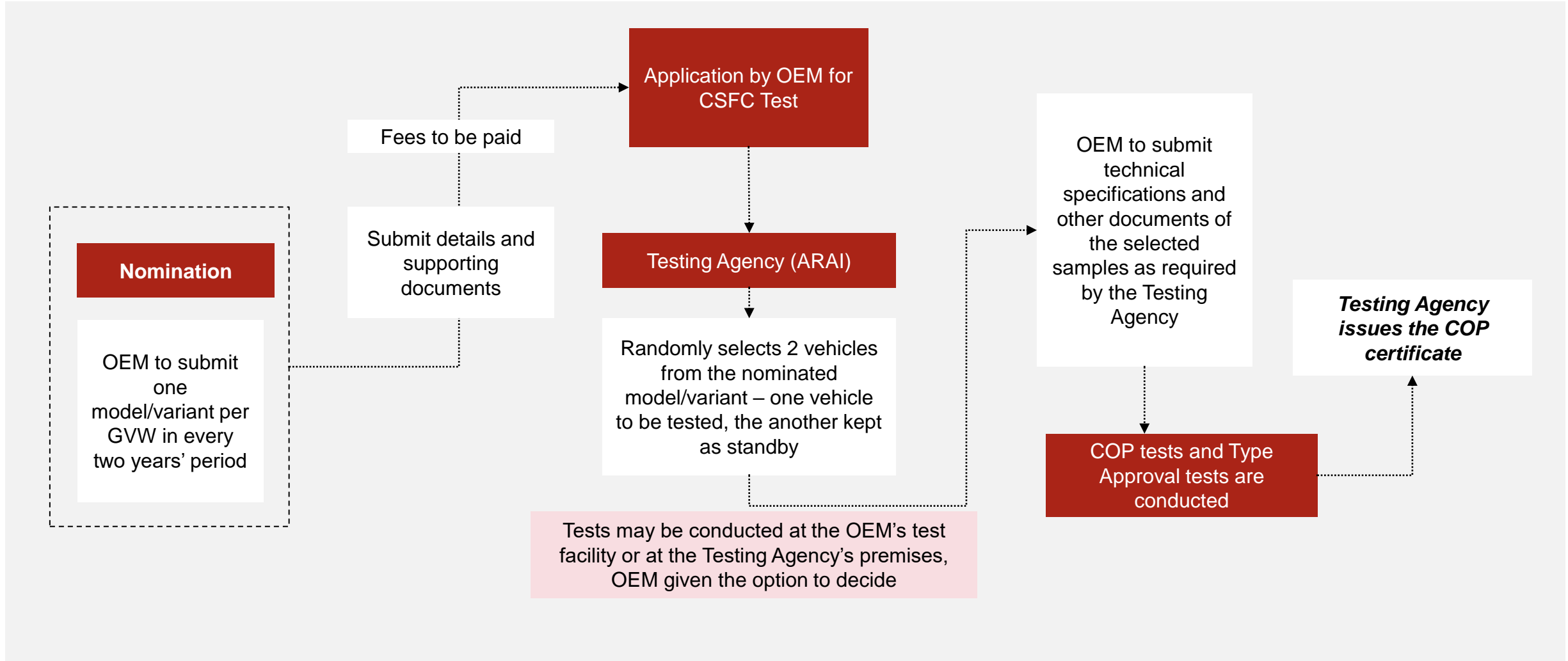
1st April
2023

CSFC testing to be implemented

These standards are expected to reduce fuel consumption by 22.97 million tons by 2025

In the CSFC protocol, trucks are driven at a steady speed of 40 kmph and 60 kmph on a test track, while buses are driven at 50 kmph

Government has outlined process for manufacturers for applicability of CSFC norm

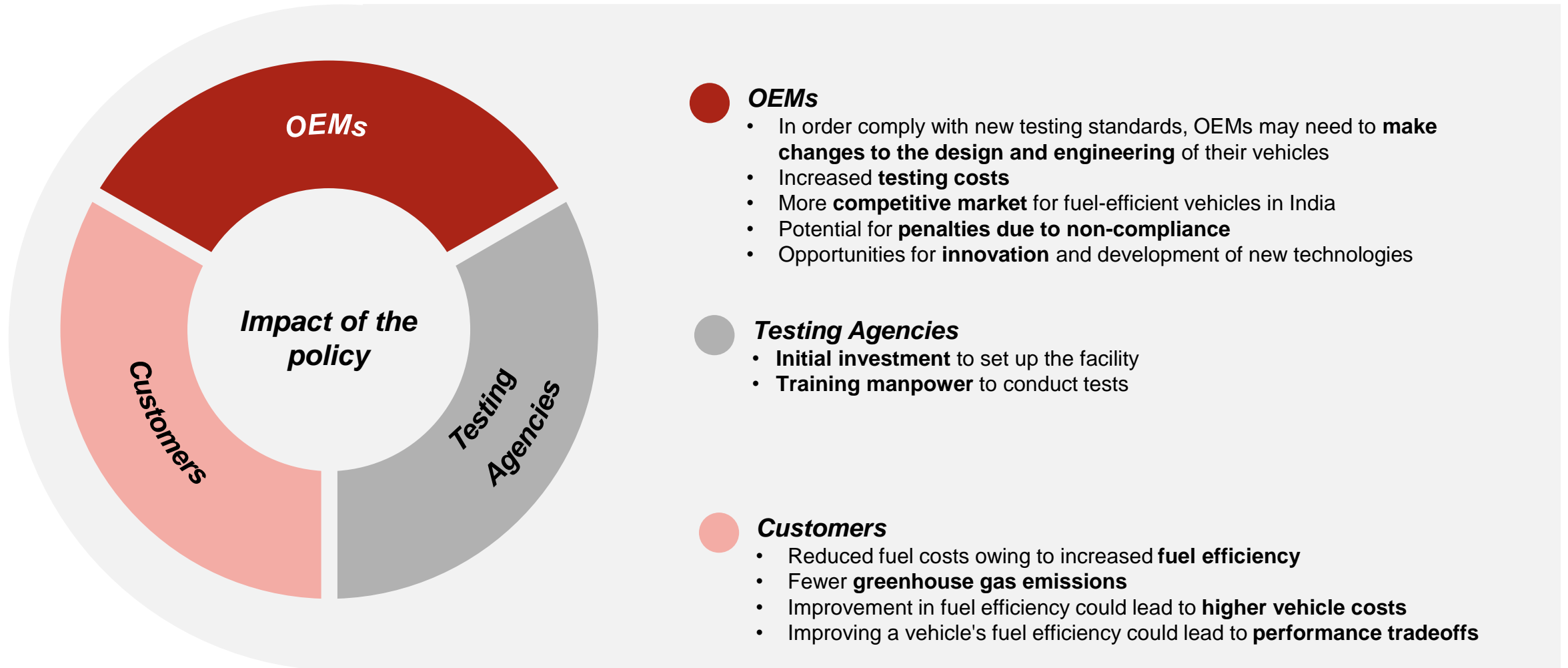


Developed economies have formulated their own testing standards for CSFC but no globally accepted standards

Currently, there is no globally accepted standard for CSFC testing. However, several countries and regions have developed their own fuel efficiency testing procedures and standards

Country	Year of introduction	Description
Japan	1985	The fuel efficiency standards in Japan are governed by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). MLIT also oversees the Top Runner Program, which sets voluntary fuel efficiency targets for automakers
European Union	1992	In addition to setting fuel efficiency standards, the EU also has a system of CO2 emissions targets, which are designed to encourage automakers to produce more fuel-efficient vehicles
USA	1975	The EPCA established Corporate Average Fuel Economy (CAFE) standards, which require automakers to meet certain average fuel efficiency levels across their fleet of vehicles
China	2004	The Ministry of Ecology and Environment (MEE) governs fuel efficiency standards, it is responsible for developing and enforcing environmental regulations
Canada	1982	In an initial attempt to make Company Average Fuel Consumption (CAFC) targets mandatory for all auto manufacturers, the Motor Vehicle Fuel Consumption Standards Act (MVFCSA) was passed

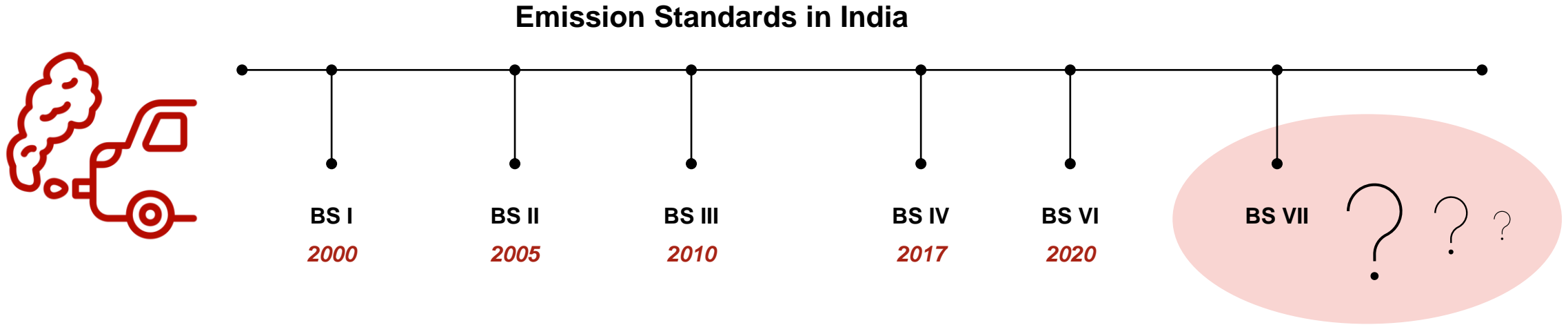
CSFC ratings will have implications for OEMs and Customers



Emissions

Global standards

Indian automakers need to be prepared for the stringency in emission norms in line with Euro VII



Expected changes in line with Euro VII

1. Same emission limits for all vehicles in same category – Petrol, Diesel, EV, Alternate fuel
2. Additions over currently regulated pollutants – Ammonia, Formaldehyde, Nitrous Oxide
3. Increase in compliance by duration or of use or KMs run
4. Limits on non-exhaust emissions – Particle emissions from brakes, Microplastics from tyres

Implications for Auto OEMs/ Component Suppliers – New additions in vehicles

- 1 On-board Emission Monitoring Systems (OBM)
- 2 On-board Fuel & Energy Consumption Monitoring Device (OBFCM)
- 3 Excess Emissions Driver Warning System
- 4 Geo-fencing technology – Technologies that do not allow a hybrid vehicle to run on ICE when inside a specific geography

Global vehicular emission standards

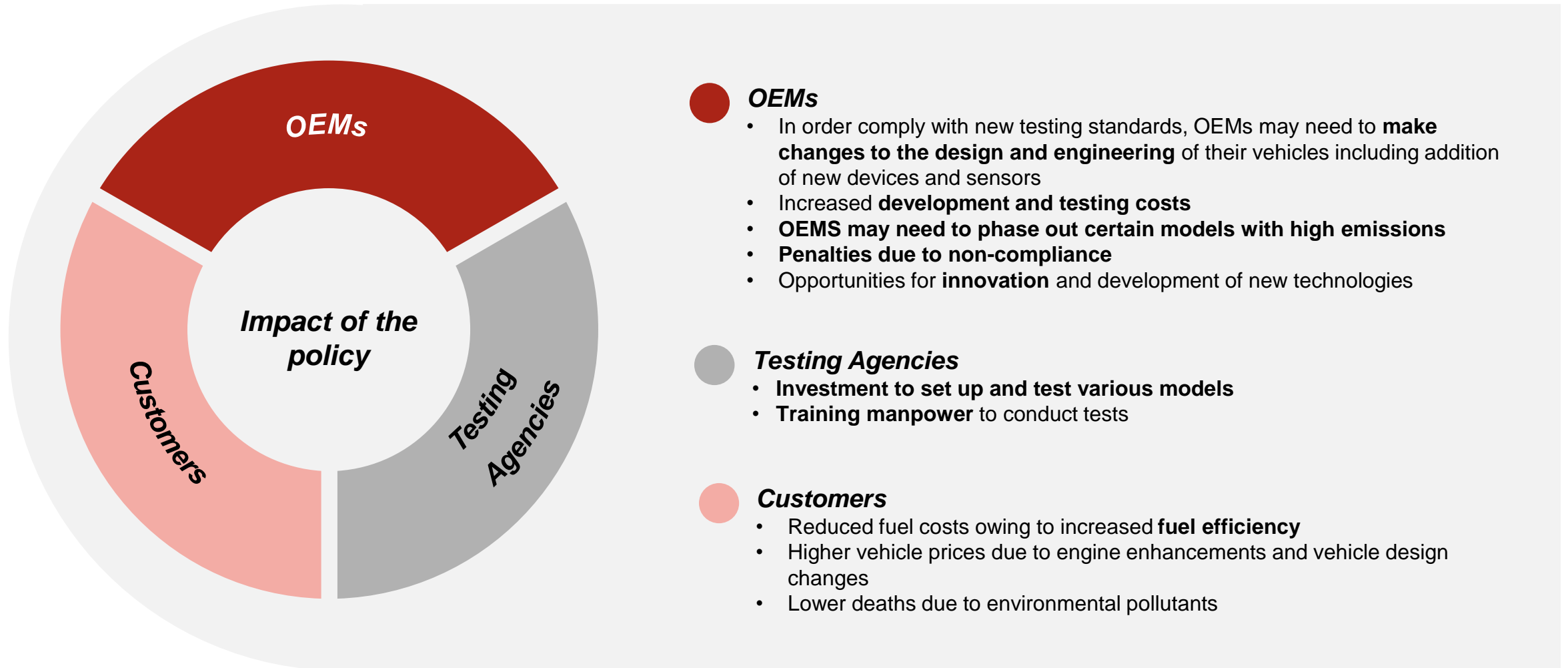
Country	Emission Standard	Emission thresholds	Applicable since	Emission standards proposed	Applicable from
China	China VI A standards	CO – 0.7 g/km, HC – 0.1 g/km, NOx – 0.06 g/km	2019	China VI B standards	1 July, 2023
USA	US 2010	CO – 0.5 g/km, NMOG + NOx – 0.17 g/km (Diesel)	2010	Multi-pollutant emission standards for model year 2027	2027
EU	Euro VI	CO – 0.5 g/km, HC + NOx – 0.17 g/km (Diesel)	2014	Euro VII	Cars and Vans – July 1, 2025 Trucks and Buses – July 1, 2027
Japan	Post New Long-Term Emission Standards	CO – 0.63 g/km, HC – 0.02 g/km, NOx – 0.08 g/km	2010	2019 Standards	2030
Brazil	Proconve L-7	CO – 1 g/km, NMOG + NOx – 0.08 g/km	2022	L-8	January 1, 2025

All are equivalent to Euro VI

Developed economies like US, Japan propose regulations much in advance (7-10 years) giving manufacturers sufficient lead time to develop fuel-efficient technologies

Developing economies, already behind on tech-curve and emission standards, give less time to manufacturers (3-5 years) to adapt to stringent regulations

Stringent emission norms will have implications for OEMs and Customers

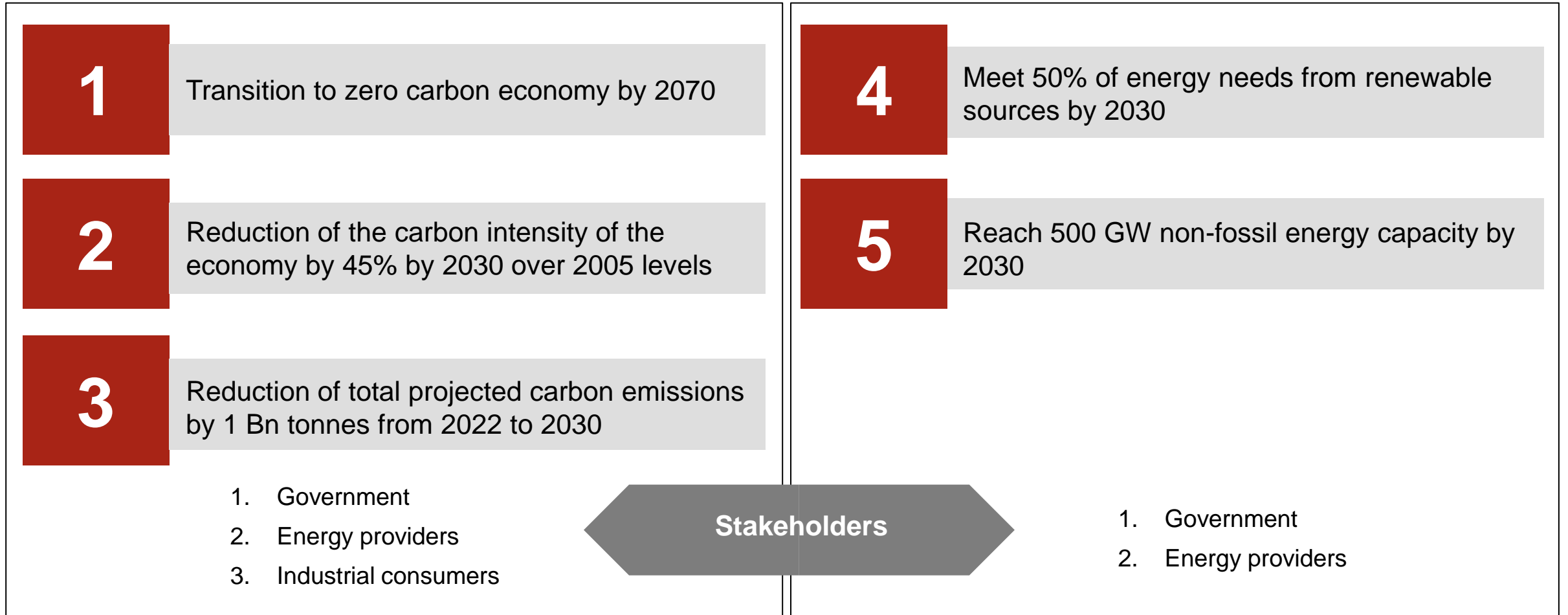


Emissions

Carbon Credit Trading Scheme

India's transition to reduce carbon footprint requires considerable efforts from all stakeholders

India's commitments in COP meets -



To encourage industry participants to reduce their carbon intensity, government has shared draft for carbon credit trading scheme

As per the scheme, the Centre will constitute a 20-22-member **national steering committee (NSC)**, headed by the power and the environment secretaries, **to govern and have a direct oversight of the carbon market**

Indian Carbon Market Governing Board (ICMGB)

Ministry of Environment, Forest & Climate Change (Co-chair)

Ministry of Power (Co-chair)

Bureau of Energy Efficiency (BEE) (Member Secretary)

Ministry of Finance (Member)

Ministry of New & Renewable Energy (Member)

Ministry of Coal (Member)

Ministry of Steel (Member)

Ministry of Petroleum & Natural Gas (Member)

Niti Aayog (Member)

Central Electricity Authority (Member)

Grid Controller of India (Member)

Roles and responsibilities of ICMGB

- Oversee administration and regulatory function of Indian Carbon Market (ICM)
- Approve the process & conditions for Carbon Credit Certificate (CCC)
- Recommend rules and regulations for functioning of ICM
- Formulate guidelines for sale of CC outside India
- Recommend designated agency for issuance of CCC

Carbon Credit Certificate (CCC): Certificate issued to registered entity by the central government or an authorised agency where each certificate issued shall represent reduction/removal of one ton of CO₂ equivalent (tCO₂e)

Government has also outlined the responsibilities for key members



ICM Administrator – Bureau of Energy Efficiency

1. Develop standards, processes and methodologies for registering projects
2. Issue carbon credits certificate (CCC)
3. Develop market stability mechanism for carbon credits
4. Develop trajectories and targets for entities under compliance



ICM Registry – Grid Controller of India

1. Undertake registration of obligated and non-obligated entities
2. Maintain records of all transactions
3. Assist in development of IT platform for maintaining database of carbon credit certificates (CCC)
4. Function as meta-registry of India



ICM Regulator – Central Electricity Regulatory Commission

1. Regulate matters related to trading of CCCs
2. Safeguard interest of buyers and sellers
3. Regulate frequency of CCC trading
4. Provide market foresight and take corrective actions to prevent fraud and mistrust

Germany launched its National Emissions Trading System in 2021

Germany, like all EU member states, participates in the European Emissions Trading System (EU ETS)

Sets an overall limit on greenhouse gas emissions from



Power Stations



Energy-intensive industries



Intra-European commercial aviation

Until 2021, greenhouse gas emissions from the transport and building heating sectors had no German or EU-wide price.
Germany launched its national Emissions Trading System for heating and transport fuels in 2021

The German national emissions trading system for transport and heating fuels will **exist in parallel with the EU-wide ETS**

The new system is going to be a **'cap and trade' system** in which the federal government sets an annual total emissions limit

The responsible government organ is the **Federal Environment Agency (UBA)**

Sectors covered under the German National Emissions Trading System



Transport and heating fuels, such as petrol, diesel, heating oil, natural gas and coal



Heating emissions in the buildings sector and of energy and industry facilities not covered by the EU ETS



Transport emissions except for air transport



Does not cover non-fuel emissions (e.g., methane in agriculture)

Carbon Credit policies implemented in USA




<i>Policies governing the carbon market</i>		<i>Voluntary Carbon Offset Programs</i>	
National level	<p><i>Cross-State Air Pollution Rule (CSAPR)</i></p> <ul style="list-style-type: none"> Passed in 2011 Provides a 4-step process to address interstate transport of certain air pollutants The US Environmental Protection Agency (EPA) sets a pollution limit (emission budget) for each of the states covered by CSAPR 	1	The Verified Carbon Standard
			The Program focuses on GHG reduction attributes only and does not require projects to have additional environmental or social benefits
California	<p><i>Cap-and-Trade Program</i></p> <ul style="list-style-type: none"> It was the first multi-sector cap-and-trade program in North America Implemented in January 2013 The California Air Resources Board (CARB) governs the program 	2	The Gold Standard
			It puts the UN Sustainable Development Goals (SDGs) front and center when certifying offset projects
11 Northeast states	<p><i>Regional Greenhouse Gas Initiative (RGGI)</i></p> <ul style="list-style-type: none"> It is a cooperative effort among 11 states to cap and reduce power sector CO2 emissions The first mandatory cap-and-trade program in the United States to limit carbon dioxide emissions from the power sector 	3	Climate Action Reserve (CAR)
			CAR registers and certifies carbon offset projects based on their permanence. Their GHG reductions must also be accounted for and audited
		4	American Carbon Registry
			ACR operates in both voluntary and regulated carbon markets and assesses projects using scientific carbon offset standards and demands permanent carbon reduction or removal

Alternate Powertrains:

Regulation

National Green Hydrogen Mission

National green hydrogen mission envisages reduced dependence on fossil fuels with H₂ as fuel source

Hydrogen types		Black/Brown/Grey Hydrogen	Blue Hydrogen	Green Hydrogen (GH ₂)
	Process	Reforming or gasification	Reforming or gasification with carbon capture	Electrolysis
	Energy source	Fossil fuels (Methane or coal)	Fossil fuels (Methane or coal)	Renewable energy
	Emission from production	CO ₂ is emitted (highest)	CO ₂ emissions are captured and stored	Zero CO ₂ emission (lowest)

- National Green Hydrogen Mission is a program to **incentivize the commercial production of green hydrogen** and **make India a net exporter** of the fuel
- The Mission will facilitate demand creation, production, utilization and export of Green Hydrogen

Expected outcome of the mission by 2030

At least
5 MMT
GH₂ annual
production

60-100 GW
electrolyser
capacity

125 GW
RE capacity for GH₂
generation and
associated transmissi
on network



Total outlay approved: ₹19,744 crore



₹1 lakh crore import
savings



50 MMT CO₂
annual emissions averted



6 lakh
jobs



₹8 lakh crore
investment

MMT – Million Metric Tonnes

Toyota and the International Centre for Automotive Technology (iCAT) have begun conducting a pilot project to evaluate the Toyota Mirai hydrogen Fuel Cell Electric Vehicle (FCEV) on Indian roads and climatic conditions

Objectives have been drawn till FY30 for green hydrogen mission with year wise targets



Facilitate	---	Notification of targets	Preparatory steps for implementation	Implementation	
Green Fertilizers	---	Notification of Bids & Award of Capacity	Construction	Green Fertilizer production	
SIGHT	Consultation and Market Review	Notification of Incentive Schemes	----	Implementation of incentives	
Pilots & Hubs	Roadmap for key sectors	Call for Proposals Phase I Implementation		Call for Proposals	Phase II Implementation
Regulations & Standards	Approval of pilot projects	Relevant International standards adoption	Continuous Review and Monitoring		
R&D	Roadmap formulation	Call for Proposals Phase I Implementation		Call for Proposals	Phase II Implementation

Objectives



Making India a **leading producer and supplier** of Green Hydrogen in the world



Creation of **export opportunities** for Green Hydrogen and its derivatives



Reduction in dependence on imported fossil fuels and feedstock



Development of **indigenous manufacturing capabilities**



Attracting investment and business opportunities for the industry

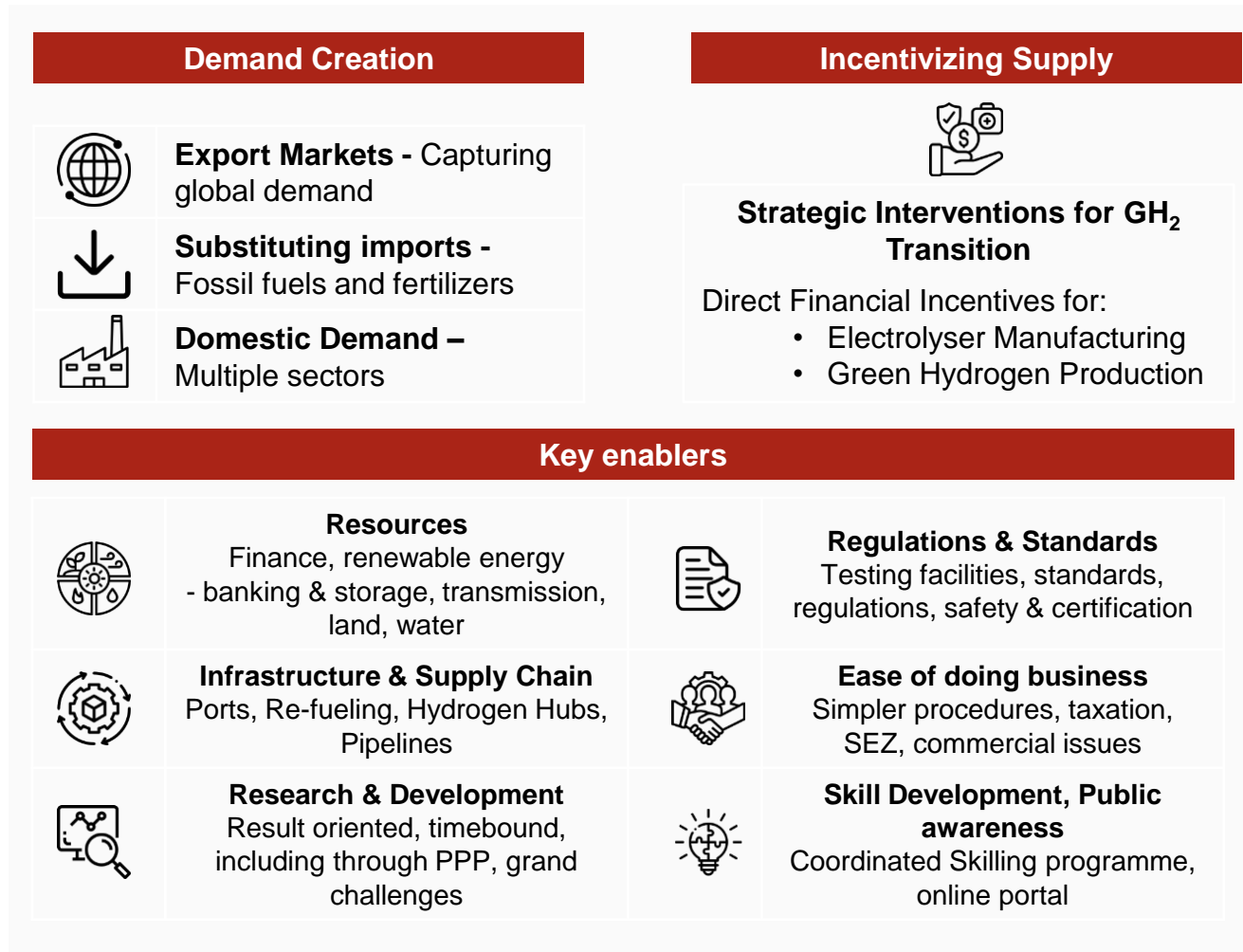


Creating opportunities for **employment** and economic development



Supporting **research and development** projects

Automotive sector, as one the key energy consumption sectors, is seen as a critical sector for green hydrogen pilot projects



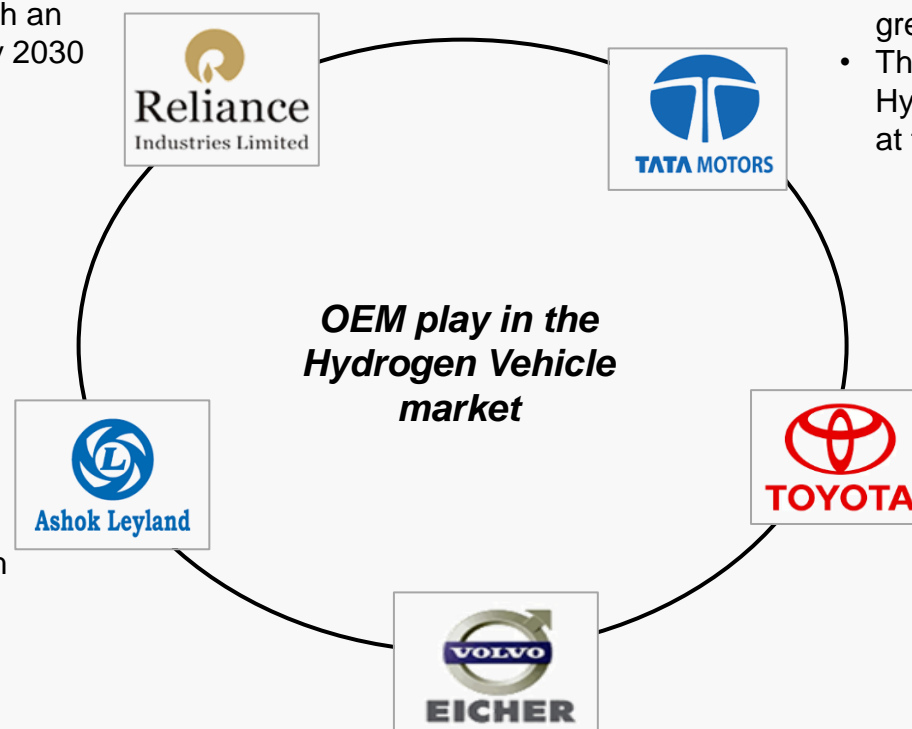
Pilot projects for automotive sector

- Considering Hydrogen’s advantages for heavy-duty, long-haul vehicles, **certain routes will be labelled Hydrogen Highways**
- The necessary Green Hydrogen production projects, **distribution infrastructure, and refueling stations will be built along such highways**
- This will **enable** Hydrogen fueled inter-state **buses and commercial vehicles to ply on such routes**

- The Mission proposes to support **deployment of FCEV buses and trucks, in a phased manner** on pilot basis
- **Financial assistance** will be provided to close the viability gap due to the relatively higher capital cost of FCEVs in the initial years
- The Mission will also explore the **possibility of blending Green Hydrogen based Methanol/Ethanol** and other synthetic fuels derived from Green Hydrogen **in automobile fuels**

OEMs in India have taken an active interest in development of hydrogen fueled powertrains

- Reliance Industries and Ashok Leyland on unveiled India's first Hydrogen Internal Combustion Engine (H2-ICE) powered truck
- To develop green hydrogen ecosystem with an investment of more than US\$ 4.4 billion by 2030



- Tata Group intends to infuse over US\$ 5 billion in the entire green-hydrogen value chain.
- They showcased 2 Hydrogen fuel cell vehicles, 1 Hydrogen internal combustion engine and 2 bi fuel vehicles at the Auto Expo 2023.

- Adani Enterprises Limited signed an agreement to launch a pilot project to develop a hydrogen fuel cell electric truck for mining logistics and transportation with Ashok Leyland and Ballard Power. The truck is to be launched in 2023

- Toyota iCAT have begun conducting a pilot project to evaluate the Toyota Mirai FCEV on Indian roads and climatic conditions

- VECV aims to invest ₹250 crore in hydrogen-based technologies in the next 3-4 years

Global developments in green hydrogen-based powertrains

Europe

- The **European Clean Hydrogen Alliance**, established in 2020, promotes investments and clean hydrogen production, targeting 40 GW electrolyser installation and 10MMT renewable hydrogen production by 2030.
- The **Revised Alternative Fuels Infrastructure Directive** (2021) ensures the development of refueling points, including hydrogen infrastructure for road transport.
- The **Fuel Cells and Hydrogen Joint Undertaking** (created in 2008) supports fuel cell and hydrogen technology development.
- The **European Green Deal** aims to reduce emissions by 90% by 2050, with increased clean hydrogen use in transport and industry.

USA

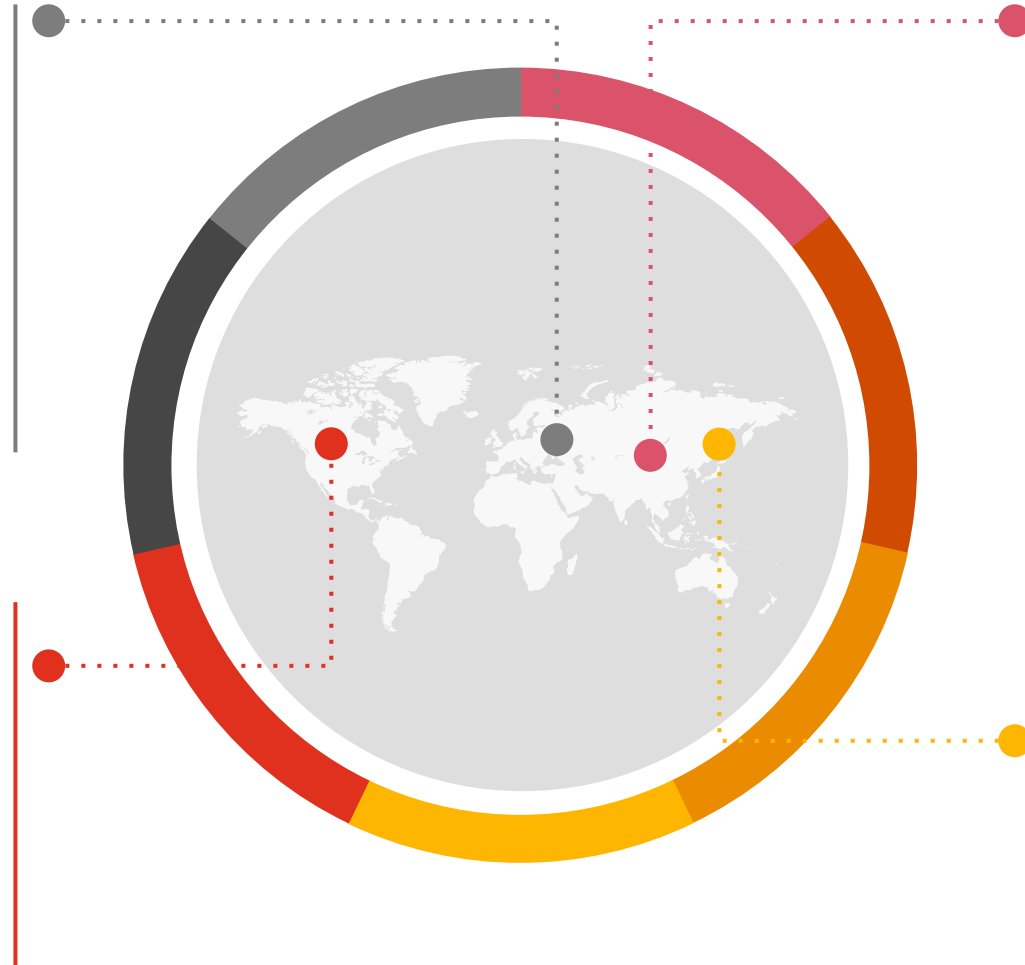
- The U.S. **Department of Energy's Hydrogen Program** conducts R&D in various sectors, including hydrogen production, delivery, infrastructure, storage, and fuel cells for transportation and industry.
- **H2USA**, launched in 2013, is a public-private partnership working on advancing hydrogen infrastructure for widespread adoption of fuel cell electric vehicles (FCEVs) in the United States.
- The government offers **Hydrogen Fuel Cell Vehicle (FCV) Tax Credits** as incentives to encourage the use of hydrogen fuel cell vehicles.

China

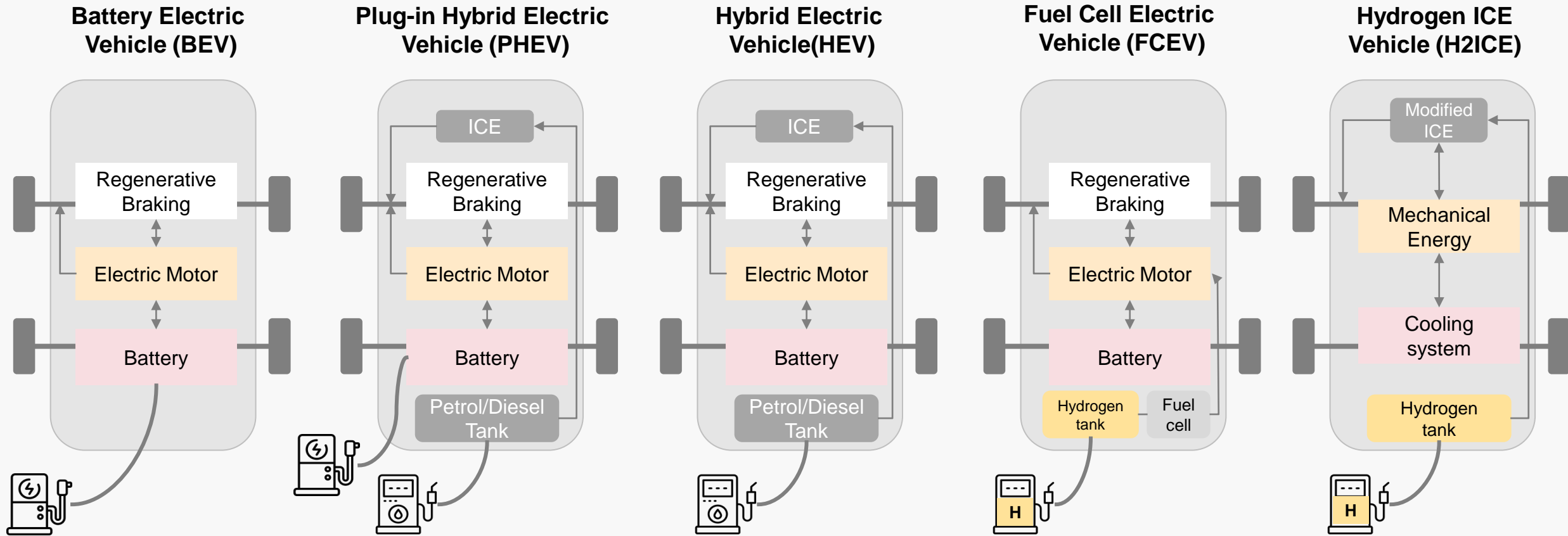
- The **National Development Plan for Hydrogen Energy and Fuel Cell Vehicles** outlines goals for the period of 2021-2035 in China.
The plan aims to have 50,000 hydrogen fuel-cell vehicles on the road by 2025 and produce 100,000-200,000 metric tons of green hydrogen annually by the same year.
- The **China Hydrogen Alliance** is an organization focused on advancing China's hydrogen energy and fuel cell industry.

Japan

- The **6th Strategic Energy Plan** aims to increase renewable energy usage and promote green hydrogen adoption in industry and transportation.
- The government **targets 200,000** fuel cell vehicles (FCVs) on the road by **2025**, along with **320 hydrogen filling stations**.
- To support this, they offer **subsidies** up to 2,550,000 Japanese Yen (US\$20,500) for the purchase of an FCV.



Hydrogen ICE vehicles are largely similar to conventional ICE engines



H2-ICEs are similar to conventional combustion engines and only a few tweaks are made to convert them to run on hydrogen. Certain components of the engine like the fuel delivery system and spark plugs are changed to use hydrogen instead of petrol or diesel.

Alternate Powertrains: Regulation

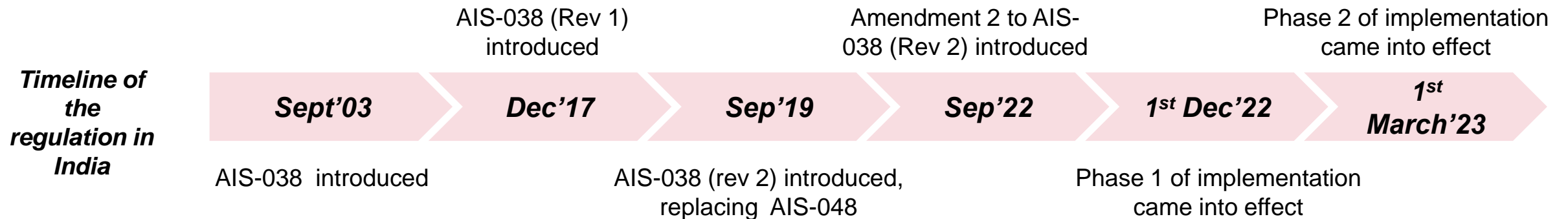
Amendment 2 to AIS-038 (Rev. 2)

AIS-038(Rev 2) sets the safety and performance standards for M and N category vehicles

The purpose of AIS-038 (Rev. 2) is to ensure that **M, N Category Electric Power Train Vehicles (EPVs)** sold in India meet the necessary **safety and performance standard.**

The standard specifies the requirements for the type approval of Electric Power Train Vehicles (EPVs) and covers aspects like **construction, design, safety requirements, and performance parameters.**

It also lays down guidelines for testing and certification of EPVs before they can be sold in the Indian market.



Requirements as per Amendment 2 (1/2)

Amendment 2 to AIS-038 (Rev. 2) outlines the technical requirements for Traction Battery (REESS) of M, N Category Electric Power Train Vehicles

#	Requirement	Implementation Phase
1	Charge discharge cycle - Cells to undergo minimum 5 cycles of charge discharge at C/3 current rate	Phase 1
2	Venting and cooling - REESS to have pressure release vent provided, joints in the coolant lines to be avoided	
3	Cell Arrangements - Sufficient cell-to-cell spacing distance should be maintained	
4	System Circuit Breaker - REESS shall have additional safety fuse or circuit breaker in addition to BMS features	
5	BMS Circuit - BMS shall be microprocessor/microcontroller-based circuit.	
6	BMS Protection Programme Verification - BMS of REESS shall be verified for Over-voltage protection, Over-charge protection, Over-discharge protection, Over-temperature protection, Overcurrent protection, Short circuit protection	
7	Onboard/Portable charging - Charger to have charge voltage cut-off, time-based charge cut-off function, soft-start function every time REESS is connected for charging, Pre-charge Function, input supply variation protection, output voltage and current regulation, earth leakage detection, communication with battery	
8	Traceability of systems and parts - Each REESS manufactured to have a traceability document to be maintained by the manufacturer	
9	Design for kinetic energy recovery - Adequate protection of cells in case of regenerative braking	
10	BMS Data storage - Data logging feature required	

Requirements as per Amendment 2 (2/2)

#	Requirement	Implementation Phase
11	Marking - Manufacturing date of battery cells to be written/embossed on the cells used to build REESS	Phase 2
12	Cell Testing - Cells to be certified as per as per IS 16893-Part 2 and Part 3 by NABL accredited lab	
13	Circuit Design - REESS to have Active paralleling circuits for the parallel connection of cells and strings to eliminate circulating currents	
14	Immersion Test - REESS with 100% SoC shall be tested for water ingress protection IP X7 as per IEC 60529	
15	Electromagnetic Compatibility - BMS shall comply EMC requirements as per AIS 004 Part 3 or AIS 004 Part 3 Rev 1 as applicable	
16	RFID tag to REESS - Each battery pack must be associated with RFID tags and the BMS should be capable of RF reading and writing	Not mandatory

Rechargeable electrical energy storage system (REESS)

EU has the most rigorous traction battery standards among global EV markets

Major traction battery standards and regulations being followed across the world



European Union



USA



China

UN 38.3 - Ensures the safety of lithium ion or lithium metal batteries during shipping

IEC 62660-1/2/3: Secondary lithium-ion cells for the propulsion of electric road vehicles-Performance test/ Abuse test/Safety requirements

ISO 12405-1/2/3: Electrically propelled road vehicles - Test specification for lithium-ion traction battery packs and systems:

- Part 1: High-power applications
- Part 2: High-energy applications, performance & abuse (SC, OC, OD)
- Part 3: Safety requirements for tests of part 182+ additional tests & clarification

ECE R100 Rev. 2

Annex & Nine tests for batteries/vehicles

- 8A Vibration
- 8B Thermal Shock
- 8C Mechanical Shock
- 80 Mechanical Integrity
- 8E Fire resistance
- 8F External Short circuit protection
- 8G Overcharge protection
- 8H Over-discharge protection
- 81 Over-temperature protection

FMVSS 305

Limits allowed electrolyte leakage and isolation for xEVS tested according to FMVSS 208, FMVSS 214, FMVSS 301

SAE J2464

15 abuse tests on cell/module/pack
Mechanical/thermal/electrical tests

SAE J2929

Defines safety requirements for tests of SAE J2426+ additional tests & clarifications

GB/T 31484, GB/T 31486

Performance cell/module

GB 38031-2020

Traction battery safety requirements for xEV batteries and battery systems

Alternate Powertrains: Regulation Amendment 3 to AIS-156

AIS 156 defines the safety standard for L category EVs

The purpose of AIS-156 is to ensure that **L Category Electric Power Train Vehicles** (EPVs) sold in India meet the necessary **safety and performance standard**.

The standard specifies the requirements for the type approval of Electric Power Train Vehicles (EPVs) and covers aspects like **construction, design, safety requirements, and performance parameters**.

It also lays down guidelines for testing and certification of EPVs before they can be sold in the Indian market.



Requirements as per Amendment 3 (1/2)

Amendment 3 to AIS-156 outlines the technical requirements for Traction Battery (REESS) of L Category Electric Power Train Vehicles

#	Requirement	Implementation Phase
1	BMS Circuit - BMS shall be microprocessor/microcontroller-based circuit.	Phase 1
2	BMS Protection Programme Verification - BMS of REESS shall be verified for Over-charge protection, Over-discharge protection, Over-temperature protection, Over-current protection, Short circuit protection	
3	Onboard/Portable charging - Charger to have charge voltage cut-off, soft-start function every time REESS is connected for charging, Pre-charge Function to detect deep discharge condition of REES, input supply variation (230 VAC +/- 10%) protection, communication with battery (BMS)	
4	Charge discharge cycle - Cells to undergo minimum 1 cycle of charge discharge at C/3 current rate	
5	Cell Arrangements - Sufficient cell-to-cell spacing distance should be maintained basis cell geometry	
6	System Circuit Breaker - REESS shall have additional safety fuse or circuit breaker in addition to BMS features	
7	Traceability of systems and parts - Each REESS manufactured to have a traceability document to be maintained by the manufacturer	
8	Design for kinetic energy recovery - Adequate protection of cells in case of regenerative braking	

Rechargeable electrical energy storage system (REESS)

Requirements as per Amendment 3 (2/2)

Amendment 3 to AIS-156 outlines the technical requirements for Traction Battery (REESS) of **L Category Electric Power Train Vehicles**

#	Requirement	Implementation Phase
9	Immersion Test - REESS with 100% SoC shall be tested for water ingress protection IP X7 as per IEC 60529. There shall be no fire or explosion during IP X7 testing	Phase 2
10	Electromagnetic Compatibility - BMS shall comply EMC requirements as per AIS 004 Part 3 or AIS 004 Part 3 Rev 1 as applicable at ESA level	
11	Onboard/Portable charging - Charger to have earth leakage detection as per Class 1 of IS-12640 Part I 2016	
12	Thermal Propagation Test - Added to evaluate the ability of REESS to withstand thermal propagation which is triggered by an internal short circuit leading to a single cell thermal runaway and subsequent thermal propagation and shall not result in fire and explosion of REESS	
13	Marking - Manufacturing date of battery cells to be written/embossed on the cells used to build REESS	
14	Cell Testing - Cells to be certified as per as per IS 16893-Part 2 and Part 3 by NABL accredited lab or test agency notified under CMV Rule 126	
15	Venting - REESS to have pressure release vent provided, to avoid building up of internal pressure and release of gases in case internal single cell short circuit	
16	Thermal Management - REESS shall have at least 4 temperature sensors in the battery pack to measure the cells temperature and decision thereon by BMS	
17	Circuit Design - REESS to have Active paralleling circuits for the parallel connection of cells and strings to eliminate circulating currents	
18	BMS Data storage - Data of critical parameters of battery pack shall be logged by BMS and latest data for at least one month shall be maintained.	

India is catching up fast with tech-leaders in REESS standards

REESS testing standard	India	US	China	Japan	Germany
IEC60529 – Water Ingres testing	✓	✓			Only on charging infra and vehicle; not on battery ✓
IEC61508 – Design and deploy automatic safety systems (thermal propagation)	✓	✓		✓	✓
IS16893 – Reliability and abuse testing of lithium-ion cells; IE62660	✓	✓	✓	✓	✓
IS12640 – Earth leakage detection; IEC 60364	✓	✓			✓



Improved protection against fire hazards caused due to battery or REESS

Alternate Powertrains:

Regulation

Custom duty revision for EV

Reduction of custom duty in Li-ion battery imports

Imports

Budget Announcement

Customs duty concession on import of Li-ion batteries extended for another year

Policy previously

Customs duty on import of Li-ion battery cells to be 5% till FY23

Validity

Customs duty concession till March 31, 2024 (FY24)

Benefits

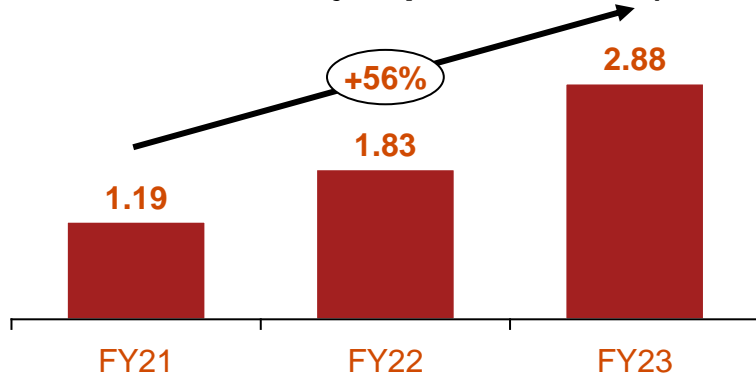
1. Lower production cost of electric vehicles
2. Greater EV adoption

While domestic battery manufacturing capability takes time to develop, this move will ensure that EVs remain cost-competitive with ICE vehicles in near term.

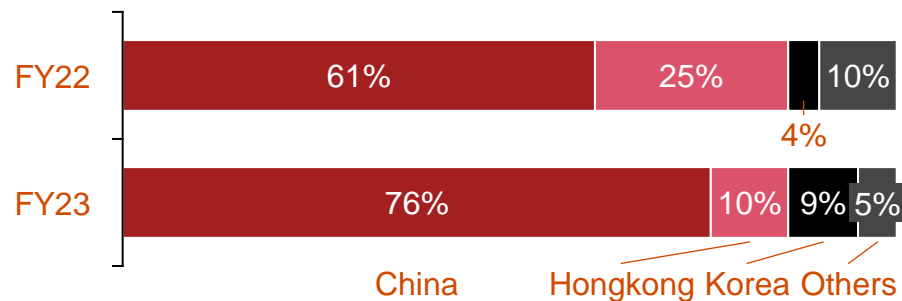
India's battery imports have grown at a rapid pace; to boost domestic manufacturing, incentives have been announced

Current demand

Lithium-ion battery imports in India (USD Bn)



Share of Top 3 in Li-ion imports (%)



Future outlook

Under accelerated scenario by NITI Aayog estimates, India's demand outlook for EV battery is projected to be at:

35 GWh/Year

2026

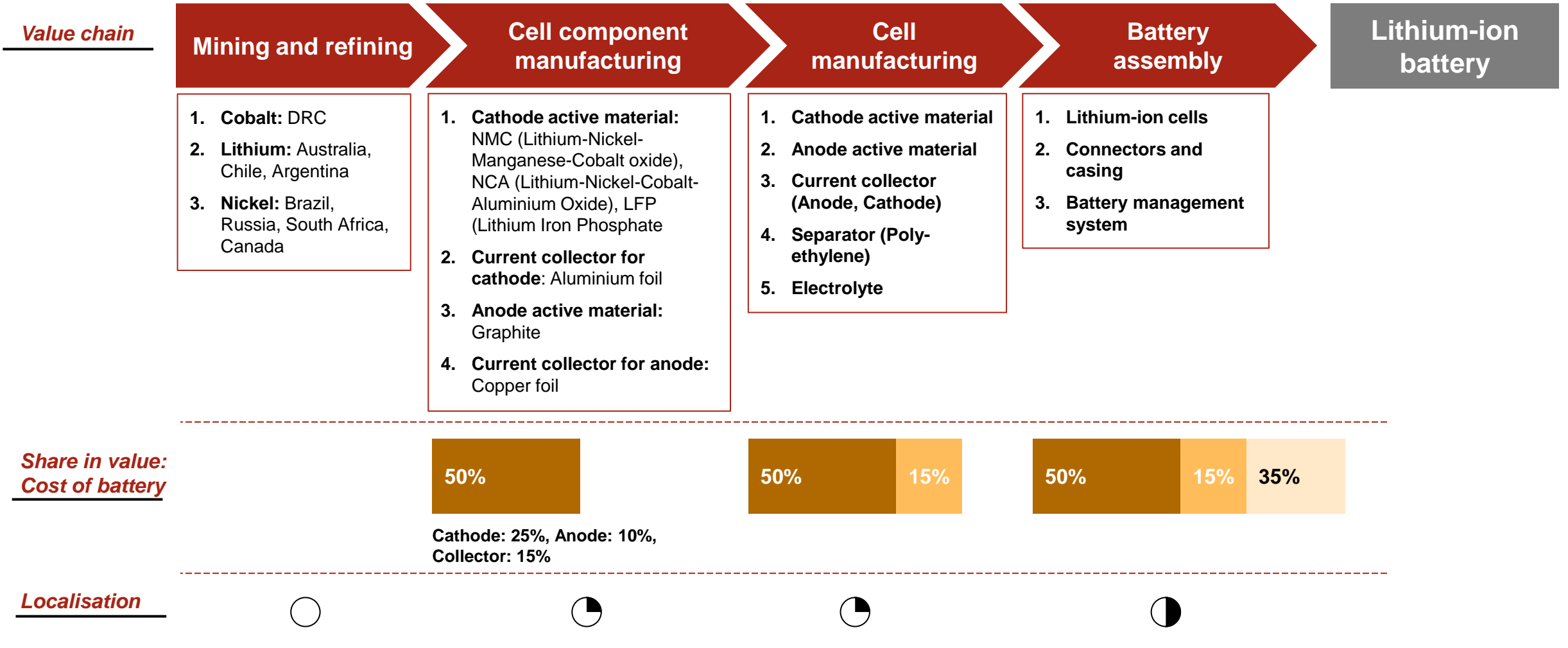
110 GWh/Year

2030

PLI scheme for advanced chemistry cell

- Identifying the need for domestic cell manufacturing, Indian government brought in Production Linked Incentive (PLI) scheme for advanced chemistry cells.
- At an outlay of 18,100 crores, the scheme envisages ACC manufacturing capacity of 50 GWh with 60% domestic value addition

Li-ion value chain is of 4 major steps with cell component manufacturing accounting for half of costs



Li-ion cell manufacturing: Processes and machinery

Value chain

Mining and refining

Cell component manufacturing

Cell manufacturing

Battery assembly

Lithium-ion battery

1

Mixing: Mixing of active material (Anode/Cathode) with additives like solvent, binder etc to form slurry

Machines: Intensive mixers, Dispersers

5

Slitting: Electrode coil is slit into smaller coils called daughter rolls

Machines: Mechanical slitting, Laser slitting

9

Packaging: Cell stacks are positioned in pouch foil and sealed

Machines: Ultrasonic welding

13

Degassing: Escaping gases are sucked off from cell

Machines: Pressurised good carriers

2

Coating: Coating of Copper/ Aluminium foil with slurry

Machines: Anilox roller

6

Vacuum drying: daughter rolls are dried for 12-30 hours

Machines: Vacuum dryer

10

Electrolyte filling: Electrolyte is filled in cell with a high precision dosing needle

Machines: Electrolyte filling machine

14

Aging: Cell characteristics and performance are measured using the open circuit voltage

Machines: Varies according to cell chemistry

3

Drying: Active material coating is dried in a continuous process

Machines: Convection dryer, IR dryer

7

Separation: Separation of anode, cathode and separator sheets from daughter rolls

Machines: Conventional punching tools

11

Roll pressing: Roll pressing to ensure optimum distribution of electrolyte

Machines: Roll pressing

4

Calendering: Copper/ Aluminium foil coated on both sides is compressed by a roller

Machines: Roller

8

Stacking: Separated electrode sheets are stacked one over another in the order anode, separator, cathode, separator

Machines: Z-folding machine

12

Formation: Charging and discharging process of battery cell

Exemption of custom duties on import of capital goods and machinery for manufacturing Li-ion cells

Manufacturing

Budget Announcement

Customs duty exemption on import of capital goods and machinery required for manufacturing of lithium-ion cells

Policy previously

Customs duty on import of capital goods and machinery ranged from 5% - 20%

Validity

Customs duty exemption till March 31, 2024 (FY24)

Benefits

1. **Boost domestic value addition of electric vehicles**
2. **Improve affordability of electric vehicles**

Discovery of Lithium reserves in Jammu and Rajasthan regions along with local manufacturing capabilities can help India become self-reliant in EV manufacturing.

Alternate Powertrains: Policies

EV Policies

Uttar Pradesh EV Policy 2022

The UP Electric Vehicle Manufacturing and Mobility Policy 2022 aims at **bringing the state into electric vehicle mode by 2030**



₹50,000 crore Investment



1 million jobs



200 charging stations by 2025

Focus Areas

Creation of charging infra

Promote transition & faster adoption of EV

Promote EV/Battery manufacturing

Success factors	Affordability	Convenience	Technology	Awareness
Areas of intervention	<ul style="list-style-type: none"> Low transition cost - Promote Scrapping, and Retro-fitment Comparative Advantage - Purchase subsidy, Road Tax, Registration fee exempt Low-cost manufacturing - Battery mftg. Hubs, Land Bank 	<ul style="list-style-type: none"> Charging - Initial focus on swapping, Charging facility at public places, Fast charging on select long routes Public Transportation - Transition to EV Buses: Inter/Intra city, Govt. Vehicles to EV: E-Auto, School Buses, Ambulances, etc. 	<ul style="list-style-type: none"> Ecosystem Support - Testing & Certification Support, Standardization Support (Battery, Swapping, etc.) Research Support Innovations - Centre of Excellence, R&D Institutes 	<ul style="list-style-type: none"> Communication - Policy benefits & comprehensive implementation, Advantage of EV transportation Go Electric Campaign - Facilitating Charging infrastructure, Dashboarding

Objectives of the EV Policy



Make UP a **global hub** for electric mobility development and manufacturing



Enable the **transition to an eco-friendly transportation** system, particularly in cities



The State Government shall target **100% transition of Govt vehicles** (for official use) to EV by 2030



The State Govt shall encourage Govt Employees to purchase EV through '**Vehicle Advances**'



Promote **research and development** in the field of electric mobility

Haryana EV Policy 2022

- The year **2022** has been declared as the “**Year of the Electric Vehicles**” in Haryana
- The cities of **Gurugram & Faridabad** will be declared as **model Electric Mobility (EM) cities** with phase-wise goals to adopt Electric Vehicles

Policy targets

2024

All Govt. vehicles, including those under Govt. Corporations, Boards, and Govt. Ambulances to be converted to EVs

2029

Transition of the entire bus fleet owned by STUs into electric buses (either BEV or FCEV)

2030

Phasing out all commercial fleets and logistics vehicles running on fossil fuels in Gurugram and Faridabad by 2024, followed by all cities by 2030

Policy highlights



To provide **50% of the project cost up to ₹1 crore** for developing **new electric charging technology** and up to **₹5 crores for new EV technology**



For **R&D in non-fossil fuel-based solutions ₹5 crores** will be provided as a **grant**



Units setting up **battery disposal units** will get **15% of FCI up to ₹1 crore**



Employment generation subsidy of ₹48,000 per employee per annum for 10 years in lieu of Haryana domiciled manpower being employed with EV companies

Chandigarh EV Policy 2022

The policy aims at enabling zero emission mobility adoption for achieving carbon neutrality in Chandigarh by 2030

Policy objectives



To accelerate adoption of EVs in the UT so that they contribute to **70% of new vehicle registrations**



To establish Chandigarh as a **'Model EV City'** by achieving one of the highest penetration of Zero EVs



To leverage the cycling track infrastructure of city for **promoting usage of Electric Bicycles** as a replacement of 2/4W



To harness the **New & Renewable Energy** sources for charging of EVs to positively impact the indirect emissions



To enable fleet transition to **zero emission vehicles**



To nurture **skill development, R&D** and startup for electric mobility space in the UT

Category	Target (Share of EVs in new vehicle registration)				
	Year 1	Year 2	Year 3	Year 4	Year 5
e2W	35%	70%	100%		
e3W (Passenger)	100%				
e3W (Goods)	20%	40%	60%	80%	100%
e4W Goods	20%	40%	60%	80%	100%
eCars Personal	10%	20%	30%	40%	50%
eCars Commercial	20%	40%	60%	80%	100%
eBuses	40%	50%	80%	90%	100% (electric / Alt. Fuel)
Charging infra	Setting up of 100 charging stations across UT by covering at least 1 charging station in every parking				

Punjab EV Policy 2022

- The policy aims to encourage the adoption of **EVs** so that they would account for **25% of all new vehicle registrations** in Punjab by 2027
- It also aims to make Punjab a **preferred location to produce EVs, their components, and batteries**

Focus areas under the Policy

- ✓ Driving adoption of two-wheelers through fiscal incentives
- ✓ Supporting the adoption of EV for the public transportation
- ✓ Creation of adequate provisions for EV Charging Infrastructure

To achieve these objectives, the following bodies will be set up

01



A Center of Excellence for EV research and development

02



A committee to oversee the implementation of the policy

03



A task force to accelerate the development of electric vehicle infrastructure

Source: Department of Transport, Punjab
Automotive Regulations in FY23 | ACMA
PwC

Type of Vehicle	Incentive
First 1 lakh electric vehicles registered in the state	Up to ₹10,000
First 10,000 electric autorickshaw and e-rickshaw	Up to ₹30,000
First 5,000 e-car buyers	Up to ₹30,000
First 5,000 LCVs	₹30,000 to ₹50,000
EV buyers	Waived registration fees, renewal fees, and road tax

Rajasthan EV Policy 2023

Policy highlights

-  **1** The state government has sanctioned **₹40 crore** towards EV purchase incentives and reimbursements of SGST for e2W, depending on the battery capacity
-  **2** The policy aims to achieve a target of **10% electric vehicles** in all vehicle registrations by 2025
-  **3** The state government will provide a **subsidy of up to ₹20 lakh** for setting up charging stations
-  **4** The state government will provide a **subsidy of up to ₹30 lakh** for the purchase of electric buses by private operators
-  **5** The policy promotes **second-life usage and recycling** of EV batteries

The policy sets a manufacturing target of 35 Lakh unit per year in the next 5 years

Category	Target for 2027
e2W	15% EV share in new vehicle registrations
e3W	30% EV share in new vehicle registrations
e4W	5% EV share in new vehicle registrations
eBuses	Phased transition to e Buses used in routes connecting priority cities

Tamil Nadu EV Policy 2023

Through the 2023 EV policy, the Tamil Nadu government aims to address sectoral challenges through interventions mapped out across the supply, demand, and ecosystem segments in the EV industry

Policy targets



Attract investments of **₹50,000 crore** in EV production



1.5 lakh new jobs throughout the state



Increase the **share of electric buses to 30%** of the fleet by 2030

To provide manufacturing firms operating in the EV sector with a **flexible incentive package** through the EV Special Manufacturing Package instead of a one size fits all model

Manufacturers **can avail any one** of
(i) reimbursement of SGST (ii) Turnover-based subsidy (iii) Capital subsidy (iv) Special ACC Capital Subsidy

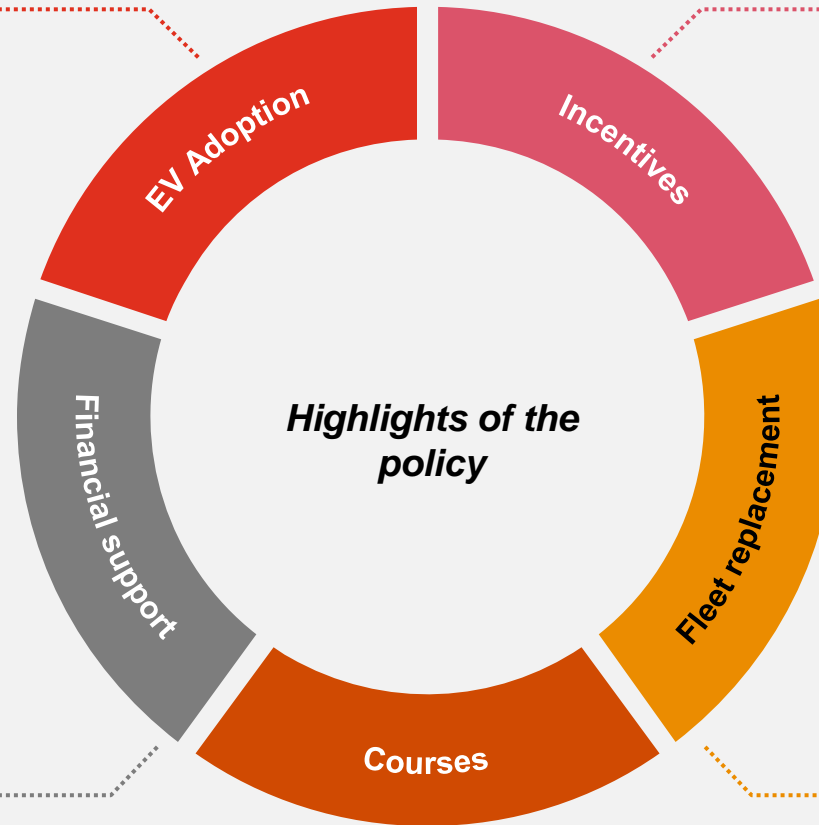
The government will via Public-Private partnership identify and prioritize the **establishment of charging stations on National and State Highways** at 25 km intervals

The Government of Tamil Nadu shall declare six cities viz. **Chennai, Coimbatore, Tiruchirappalli, Madurai, Salem, and Tirunelveli**, as **EV cities**. In each of these cities, the Smart City Commissioner will be appointed as the Nodal Officer to coordinate and drive EV adoption

EFA – Eligible Fixed Assets

Manipur EV Policy 2022

- The policy aims to facilitate the adoption of at least **20% electric vehicles** in the state by **2026**



- Aims to provide subsidies for early adoption of EVs in terms of kWh capacity
- Create a skilled workforce for the EV industry in collaboration with technical institutions

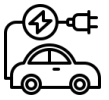
- The policy also provides incentives such as motor vehicle tax for EVs purchased and registered in the state, single window clearance for development of charging stations,
- Skill development and R&D support for EV-related start-ups

- Aims to mandate EV adoption in State Government, replace State Transport buses with electric buses in a phased manner
- Create an ecosystem for recycling and reuse of batteries

- Short-term courses related to EV, EV charging stations, and other related courses will be facilitated in collaboration with Polytechnic and Engineering Colleges

Chhattisgarh EV Policy 2022

Objectives of the EV policy



Target **15% of all vehicle** registrations to be **battery electric vehicles (BEV)** by 2027



Make Chhattisgarh a **manufacturing hub** for EVs and create employment opportunities in the sector



Establish a vast network of **charging stations** and swappable battery stations in government and private buildings



Give a **grant of 25% of the cost of plant** and machinery to develop the manufacturing of EVs

Segment wise policy targets

Classification of EV	FY23	FY24	FY25	FY26	FY27	Total
2W	2,000	8,000	20,000	54,000	85,000	1,69,000
3W	200	800	2,000	4,000	10,000	17,000
4W (Non - commercial)	200	400	1,400	3,000	7,000	12,000
4W (Commercial)	10	40	100	300	650	1,100
Buses	10	25	65	200	600	900
Total	2,420	9,265	23,565	61,500	1,03,250	2,00,000

Jharkhand EV Policy 2022



Establishment of projects for the manufacturing of **advanced chemistry cell** batteries in Jharkhand by 2027



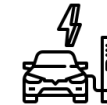
To establish **center of excellence** for EV in partnership with Industry and Academia by 2027



Target of **10% share of Electric Vehicle** in overall new vehicle registration in the State by 2027



Target for **conversion of 15 years old Government owned/leased vehicles** with Electric Vehicle



Setting up of at least one **public charging station** in a 3X3 km grid or minimum of 50 charging stations per million population, whichever is higher



Setting up of **public charging station on highways** at 25 km distance (on both sides of all National highways and major State Highways)

Ladakh EV & Allied Infrastructure Policy 2022

Strategic drivers



Establishing of Research & Development Centers to promote innovation and Excellence.



Creating of dedicated Charging infrastructure for charging of EVs.



Providing direct fiscal & non-fiscal incentives to increase the adoption of EV technology

Policy targets

#	Vehicle segment	Ceiling for Early Bird	2023-2027
1	Two-wheeler	35	172
2	Three-wheeler (E-rickshaw/E-cart)	10	40
3	Three-Wheeler	10	40
4	Car (Including Taxis)	40	167
5	Bus	11	49
6	E-Four-Wheeler (LCV, Stage Carriage/Maxi Cabs)	10	41
	Total	116	509

Demand incentives to buyers (1/2)

Uttar Pradesh

Category	Subsidy % of cost	Up to (INR)	Applicable for (#)
2W	15%	5,000	200,000
3W	15%	12,000	50,000
4W	15%	100,000	25,000
e-buses	15%	2,000,000	400
E-Goods carrier	10%	100,000	1,000

Chandigarh

Category	Up to (INR)	Applicable for (#)
e-Bicycle	3,000	25,000
2W	45,000	10,000
E-cart	50,000	1,000
E-autos	60,000	1,000
e-Goods Carrier L5N	65,000	1,000
e-Goods Carrier N1	105,000	1,000
4 W- e-Cars (Personal)	150,000	2,000
4 W- e-Cars (Commercial)	200,000	1,000

Haryana

Category	Price range (INR)	Subsidy % of cost	Up to (INR)	Applicable for (#)
Electric Car/Light EV(BEV/FCEV)	15L – 40L	15%	600,000	1,000
	40L – 70L	15%	1,000,000	1,000
Hybrid Electric Car/ Hybrid Light EV (SHEV/PHEV)	15L – 40L	15%	300,000	200
	40L – 70L	15%	500,000	200
Hydrogen based vehicle		15%	1,000,000	200
Electric Tractors for farmers		50%	500,000	1,000
Hybrid Electric tractor for farmers		50%	500,000	100
Electric Bus		10%	1,000,000	200

Punjab

Category	Subsidy % of cost	Up to (INR)	Applicable for (#)
e2W	3000 per kwh	10,000	50,000
Passenger e-cycle	25%	4,000	5,000
Cargo e-cycle	33%	10,000	5,000
e3W	3000 per kwh	30,000	5,000
e-Rickshaw	3000 per kwh	15,000	10,000
e-cart	3000 per kwh	15,000	8,000
eLCV L5N	3000 per kwh	30,000	5,000
eLCV N1	3000 per kwh	50,000	
Garbage collection vehicles	5000 per kwh	50,000	2,500

Demand incentives to buyers (2/2)

Rajasthan			
<i>Category</i>	<i>Subsidy % of cost</i>	<i>Up to (INR)</i>	<i>Applicable for (#)</i>
e2W	Fixed battery	5,000-10,000	100,000
	Swappable battery	2,000-5,000	
e3W	Fixed battery	10,000-20,000	50,000
	Swappable battery	4,000-10,000	
	Retrofit kit	10,000	3,000
e4W		30,000-50,000	4,000
	Retrofit kit	15,000	2,000
E-Buses		100,000-500,000	500
	Retrofit kit	250,000	200

Tamil Nadu			
<i>Category</i>	<i>Incentive based on battery capacity (INR/KWh)</i>	<i>Up to (INR)</i>	<i>Applicable for (#)</i>
Private eCycles	-	5,000	30,000
Commercial 2W	10,000/ kWh	30,000	30,000
Commercial 3W	10,000/ kWh	40,000	75,000
Commercial 4W	10,000/ kWh	150,000	15,000
E-buses	20,000/ kWh	1,000,000	1,500

Jharkhand			
<i>Category</i>	<i>Incentive based on battery capacity (INR/KWh)</i>	<i>Up to (INR)</i>	<i>Applicable for (#)</i>
e-2W (L1 & L2)	5000/kwh	10,000	100,000
e-3W autos (L5M)	5000/kwh	30,000	15,000
e-3W goods carrier (L5N)	5000/kwh	30,000	10,000
e-4W cars (M1)	5000/kwh	150,000	10,000
e-4W goods carrier (N1)	5000/kwh	100,000	10,000
e-buses	10% of vehicle cost	2,000,000	1,000

Ladakh			
<i>Category</i>	<i>Subsidy % of cost</i>	<i>Up to (INR)</i>	<i>Applicable for (#)</i>
2W	20%	30,000	28
3W - erickshaw	20%	60,000	10
3W	20%	100,000	10
car	20%	500,000	33
bus	50%	10,000,000	11
e 4W (LCV)	20%	600,000	9

State wise comparison

Particulars	Uttar Pradesh	Haryana	Chandigarh	Punjab	Rajasthan	Tamil Nadu	Manipur	Chhattisgarh	Jharkhand	Ladakh
Registration fee waiver	Yes	Discounted on FCFS basis	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Road tax waiver	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes (Conditional)	Yes
Stamp duty reimbursement	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No
Motor Vehicle tax exemption	No	Yes (Conditional)	No	No	Yes	No	Yes (Conditional)	No	No	No
Subsidy to buyers	500 Cr	271 Cr	130.5 Cr	136.5 Cr	Total amount not mentioned	780 Cr	Not mentioned	Total amount not mentioned.	625 Cr	13.4 Cr for early birds with an ongoing subsidy for all new reg.
Scrapping incentive	No	No	10.85 Cr	No	No	No	No	No	Assured buyback	No
Incentive for Battery recycling	No	Capital subsidy of 5 Cr	Not mentioned	Not mentioned	No	Not mentioned	Not mentioned	Not mentioned	Not mentioned	No
Charging infra/station incentives	200 Cr	20 Cr	20.75 Cr	4.4 Cr	5Cr	30 Cr	Not mentioned	Not mentioned	75 Cr	75 lakhs
Battery swapping incentives	50 Cr	10 Cr				4 Cr	Not mentioned	Not mentioned	Not mentioned	No
Lower interest on EV Loan	No	No	No	No	Yes	Yes	No	No	Yes	No
Manufacturing incentives (Capital subsidy)	Yes, amount not mentioned	89.5 Cr	Yes, amount not mentioned	130 Cr	Yes, amount not mentioned	Yes, amount not mentioned	Not mentioned	Yes, total amount not mentioned	Yes, total amount not mentioned	Not mentioned
Electricity duty exemption for manufacturing units	No	100% for 20 years	100% for Public Charging and Swapping stations	100% for 10 years	100% for Public Charging and Swapping stations for 7yrs	100% for 5 years	No	No	100% for 5 years	No
R&D expenditure	50 Cr	80.5 Cr	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned

Thank you

[pwc.com](https://www.pwc.com)

© 2023 PwC. All rights reserved. Not for further distribution without the permission of PwC. “PwC” refers to the network of member firms of PricewaterhouseCoopers International Limited (PwCIL), or, as the context requires, individual member firms of the PwC network. Each member firm is a separate legal entity and does not act as agent of PwCIL or any other member firm. PwCIL does not provide any services to clients. PwCIL is not responsible or liable for the acts or omissions of any of its member firms nor can it control the exercise of their professional judgment or bind them in any way. No member firm is responsible or liable for the acts or omissions of any other member firm nor can it control the exercise of another member firm’s professional judgment or bind another member firm or PwCIL in any way.