

# Current Status and Challenges: PM Industry in India

February 2020

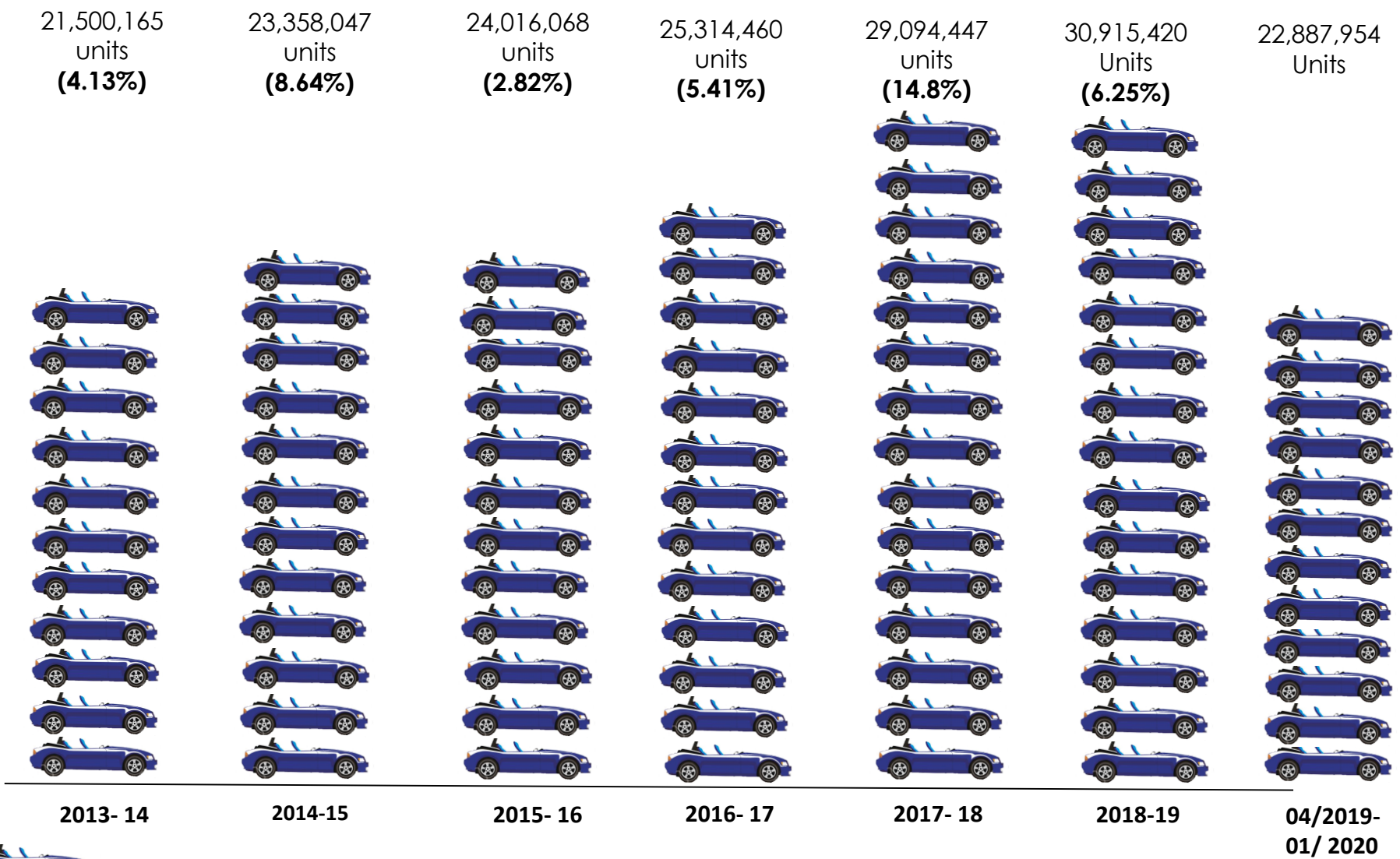
**Aniket Gore**

President

Powder Metallurgy Association of India  
(PMAI)



# Domestic Production of Vehicles in India (PV, CV, 2W, 3W)



 = 1,950,000 units

Source: SIAM

# Automobile Production Trends

Category	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	04/2019-01/2020
Passenger Vehicles	3,087,973	3,221,419	3,465,045	3,801,670	4,020,267	4,026,047	N.A.
Commercial Vehicles	699,035	6,98,298	786,692	810,253	895,448	1,112,176	N.A.
Three Wheelers	830,108	949,019	934,104	783,721	1,022,181	1,268,723	N.A.
Two Wheelers	16,883,049	18,489,311	18,830,227	19,933,739	23,154,838	24,503,086	N.A.
Quadricycle#			531	1584	1713	5388 (85%)	N.A.
<b>Grand Total</b>	<b>21,500,165</b>	<b>23,358,047</b>	<b>24,016,599</b>	<b>25,330,967</b>	<b>29,094,447</b>	<b>30,915,420</b>	<b>22,887,954</b>

Source: SIAM



# Domestic Sales Trends

Category	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	04/2019-01/2020
Passenger Vehicles	25,03,509	26,01,236	27,89,208	30,47,582	32,88,581	33,77,436	23,80,699
Commercial Vehicles	6,32,851	6,14,948	6,85,704	7,14,082	8,56,916	10,07,319	645,991
Three Wheelers	4,80,085	5,32,626	5,38,208	5,11,879	6,35,698	7,01,011	567,659
Two Wheelers	1,48,06,778	1,59,75,561	1,64,55,851	1,75,89,738	2,02,00,117	2,11,81,390	1,52,55,979
Quadricycle#			0	0	0	Domestic (85%#	
<b>Grand Total</b>	<b>1,84,23,223</b>	<b>1,97,24,371</b>	<b>2,04,68,971</b>	<b>2,18,63,281</b>	<b>2,49,81,312</b>	<b>2,62,67,783</b>	<b>1,88,50,628</b>

Source: SIAM



# Automobile Export Trends

Category	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	04/2019-01/2020
Passenger Vehicles	5,96,142	621,341	653,053	758,727	748,366	676,193	N.A.
Commercial Vehicles	77,050	86,939	103,124	108,271	96,865	99,931	N.A.
Three Wheelers	353,392	407,600	404,441	271,894	381,002	567,689	N.A.
Two Wheelers	20,84,000	24,57,466	24,82,876	23,40,277	28,15,003	32,80,841	N.A.
Quadricycle#	0	0	334	1,556	1,605	4,400 (85%)	N.A.
<b>Grand Total</b>	<b>31,10,584</b>	<b>35,73,346</b>	<b>36,43,828</b>	<b>34,80,725</b>	<b>40,42,841</b>	<b>46,29,054</b>	<b>N.A.</b>

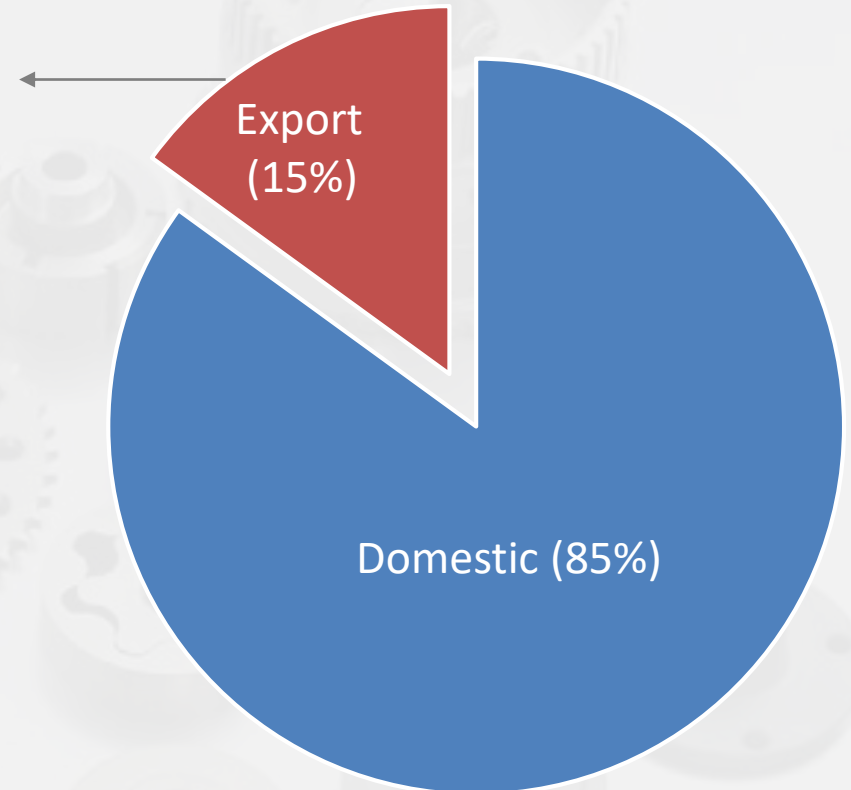
Source: SIAM



# Domestic vs Export

Increased by 39.36% in last 6 years.

Aggressive action by Government to promote India as a manufacturing hub including 100% FDI (direct route).



# Sourcing Hub for Engine parts

- Engine Parts (31%) and Drive Transmission & Steering (19%) top components produced in India
- Engine manufacturing units
  - Ford, Fiat, Suzuki and General Motors

## On The Fast Track

Suzuki is likely to infuse **\$780m** in a third factory in Gujarat by 2020

Maruti will invest **₹1,900cr** on expansion of R&D centre in Rohtak, Haryana

Kia Motors will invest **\$1.1b** to set up a factory in Andhra Pradesh

Hyundai Motor India plans to invest **\$2b** on products alone

Beiqi Foton started work on a factory at Chakan, Pune with investment of **\$280m**

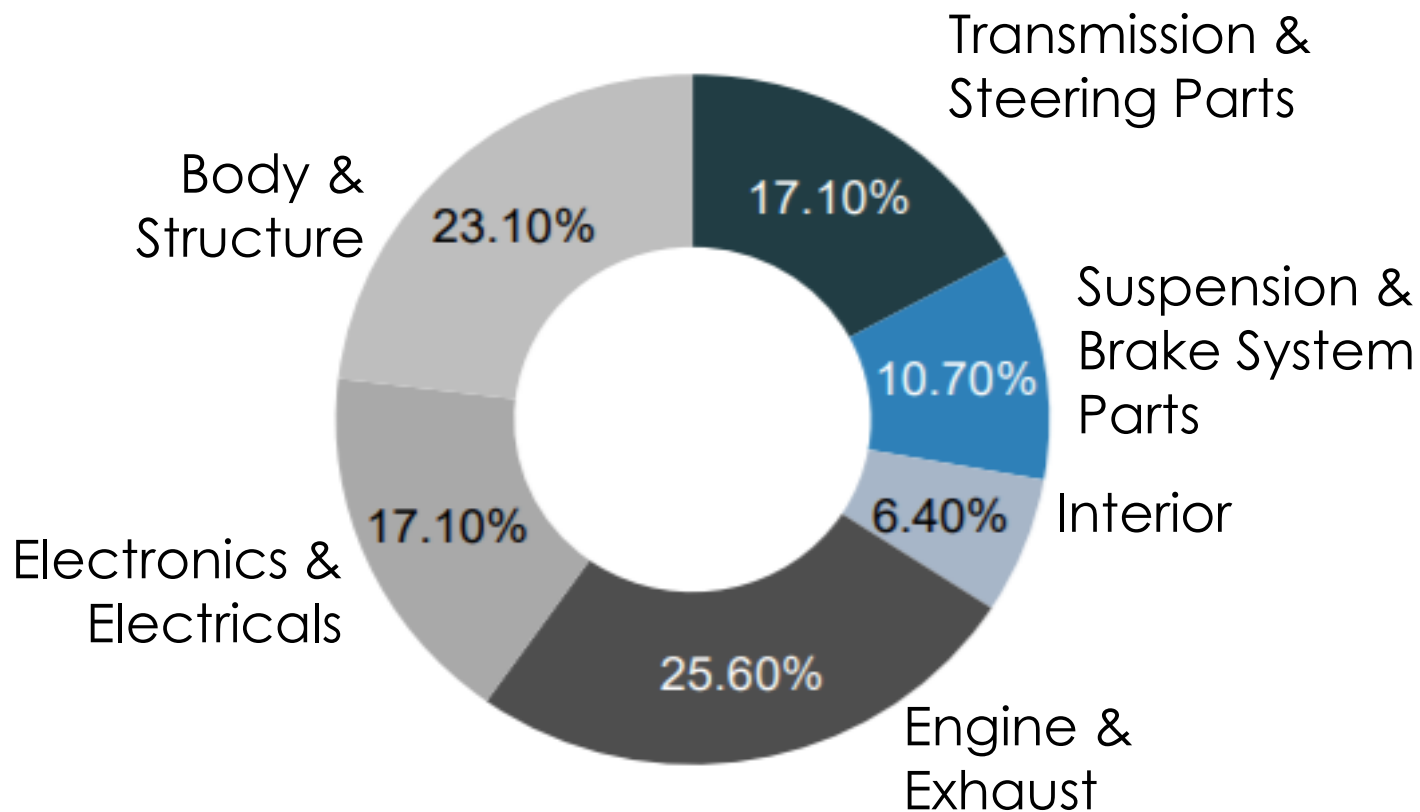
SAIC likely to finalise on Halol in Gujarat as the location for its factory

Changan Automotive expected to build facility at Oragadam, Chennai or Sanand, Gujarat

Fiat infusing money to introduce new brands, use India as export base for Jeep SUVs

Volvo too is close to announcing investment on an Indian assembly facility

# Projected Domestic Market by Auto Components (2020E)

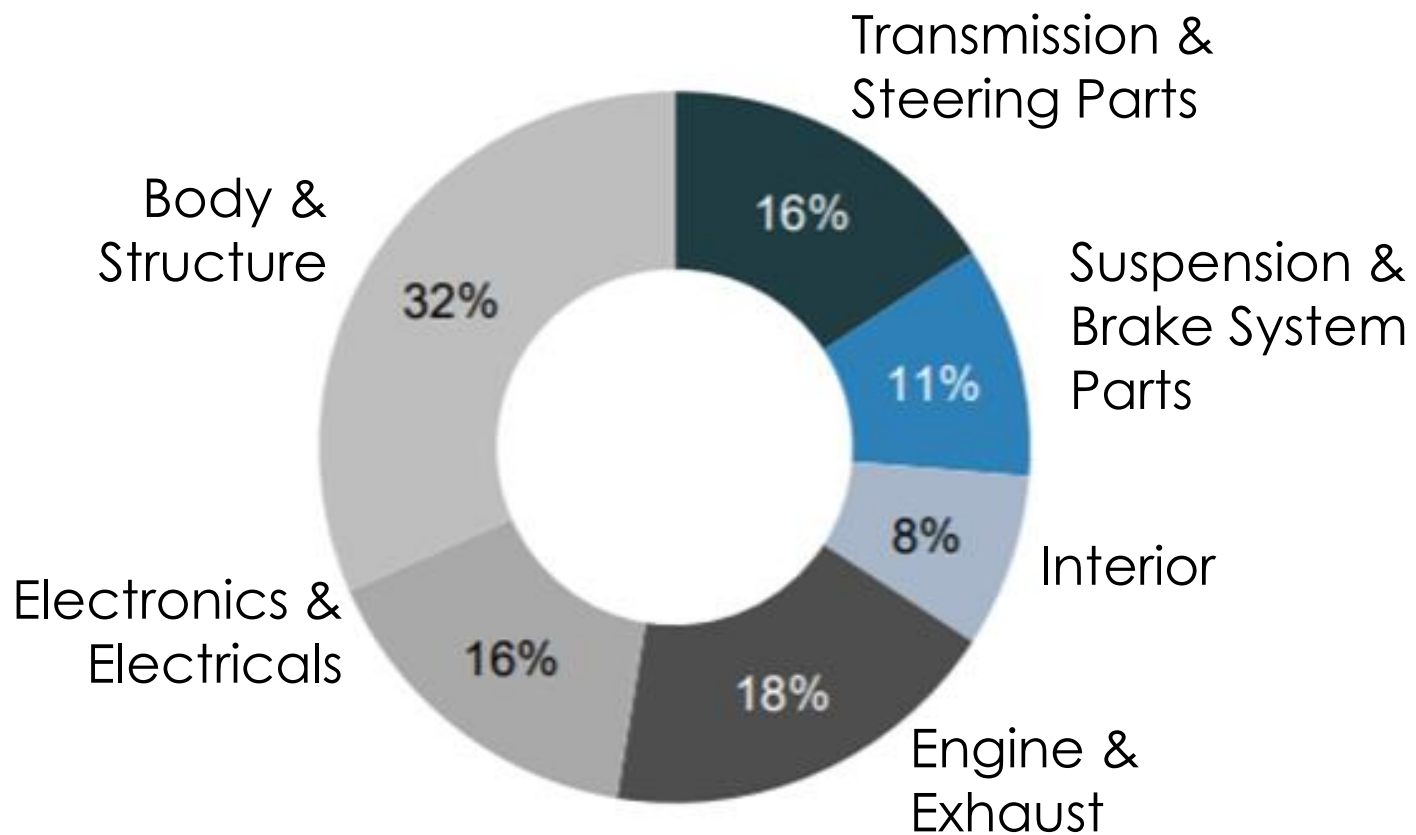


Source: IBEF





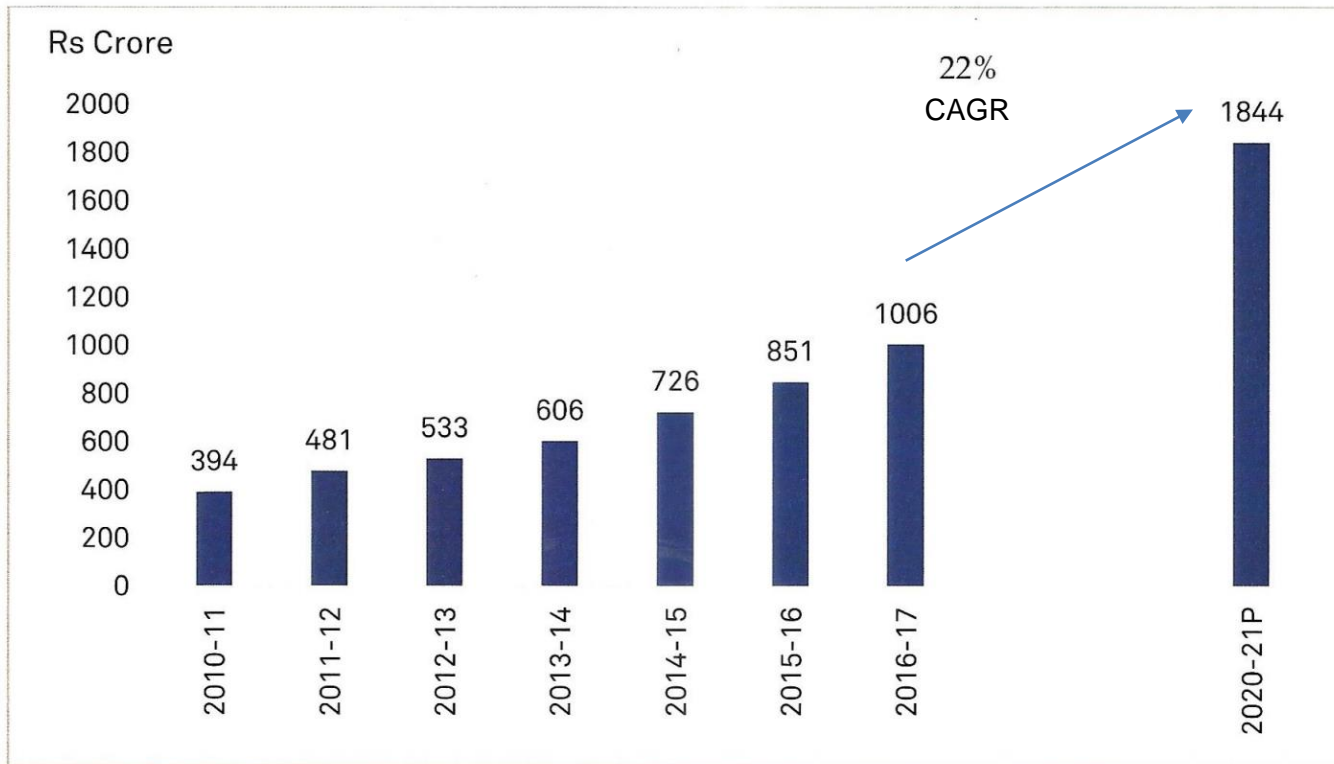
# Projected Export Market by Auto Components (2020E)



Source: IBEF



# Market for Sintered Auto Components



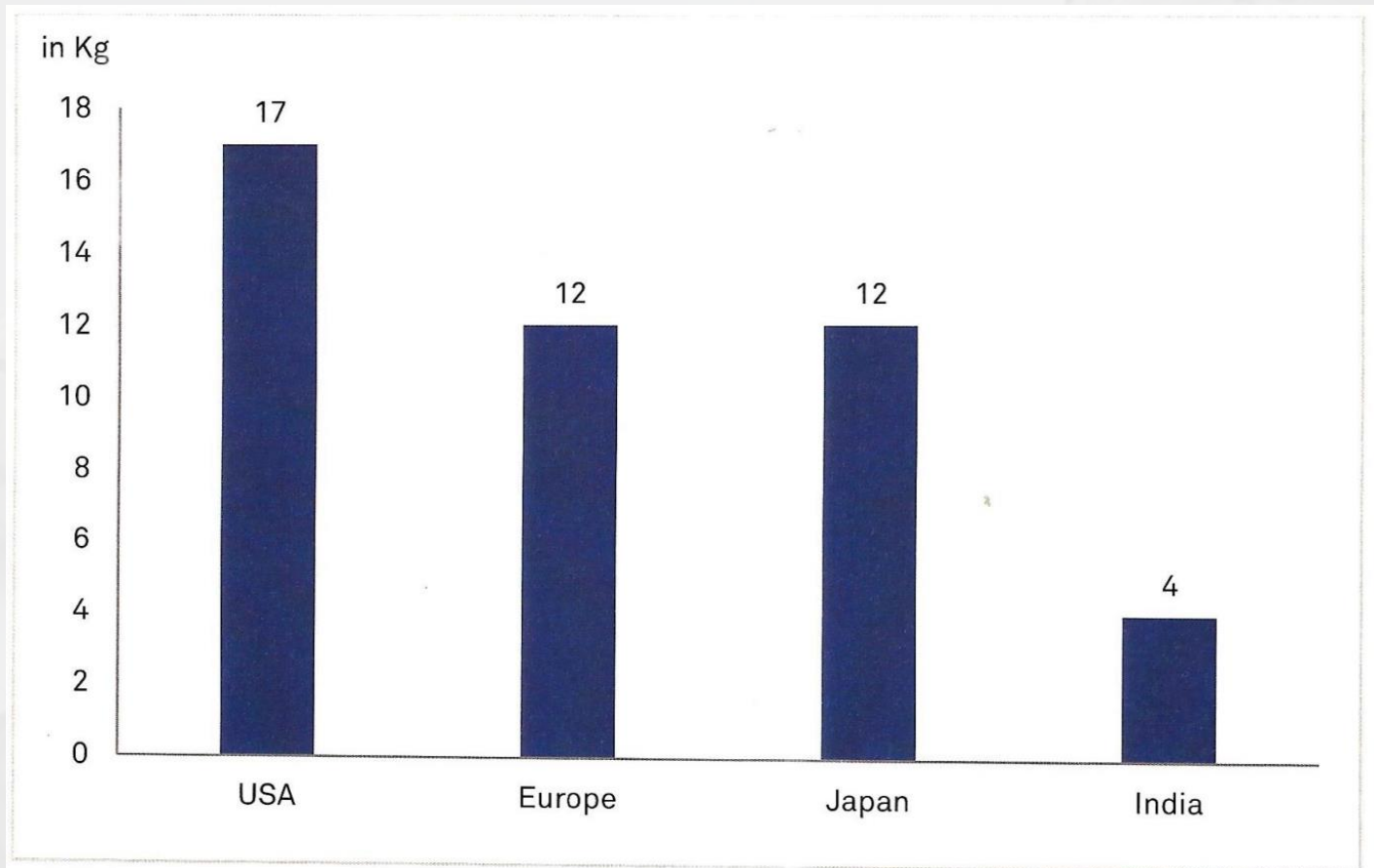
Market stands at  
Rs 1100 cr  
(~USD 155 mn)

Two wheeler  
and Passenger  
Vehicles major  
drivers of  
demand

Source: CRISIL Research, CRISIL Ratings, Company reports



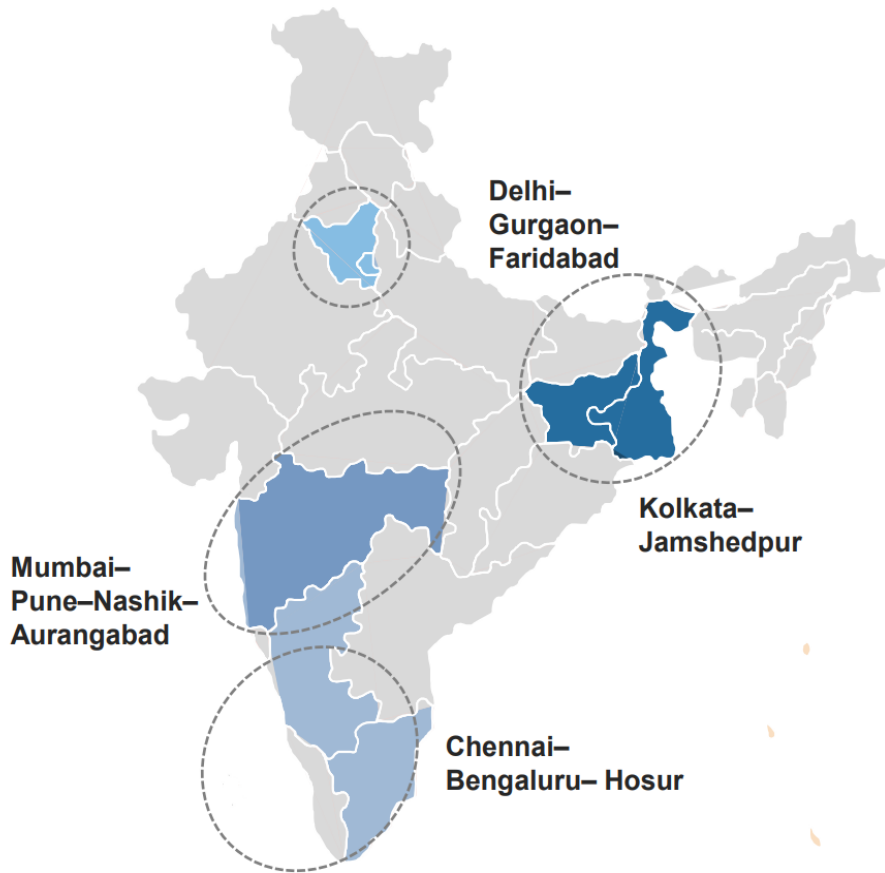
# Sintered Parts (Kg) per Vehicle



Source: CRISIL



# Foreign Investments + Expansion of Domestic Players



Over the past few years four specific regions in the country have become large auto manufacturing clusters, each present with a different set of players.

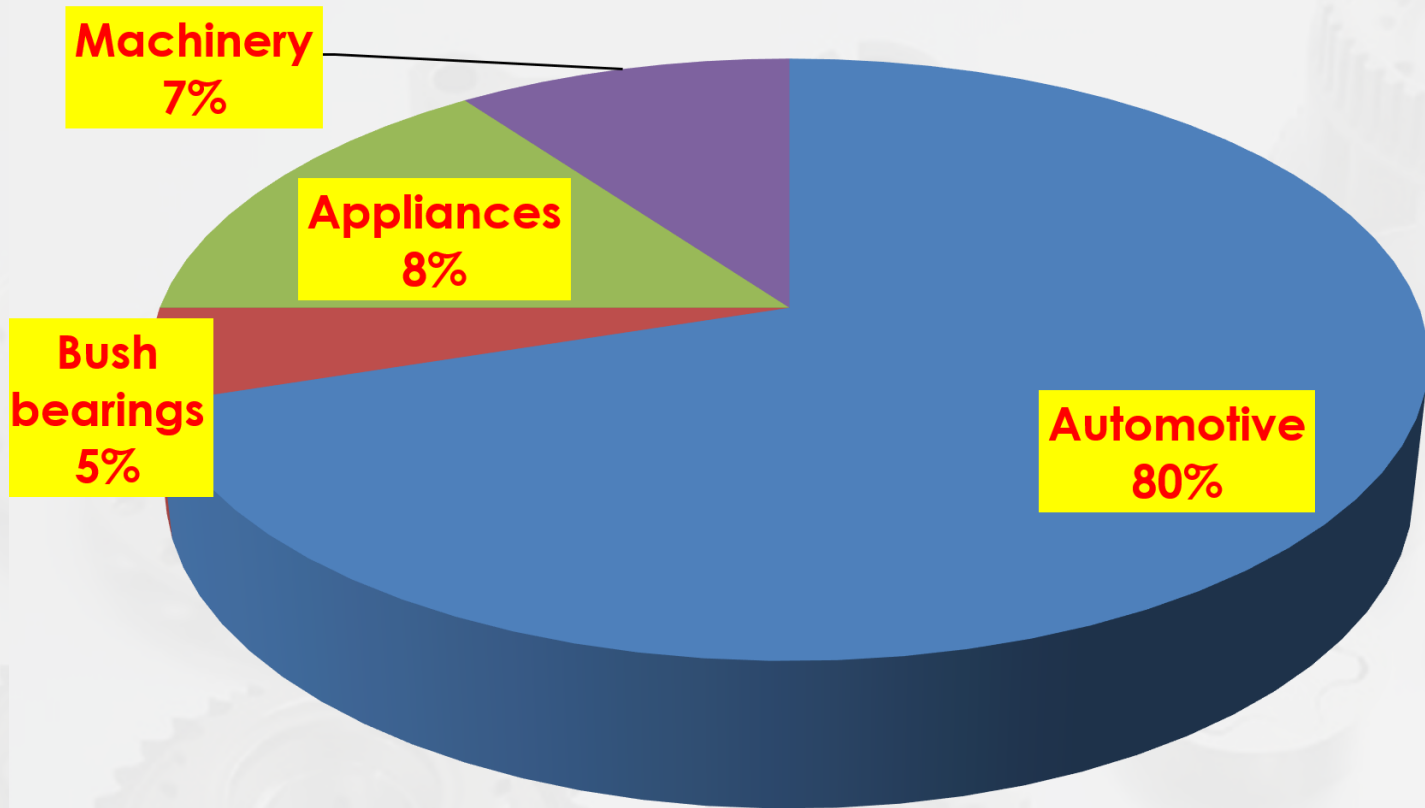
# PM Production in India

India Data -- All PM applications (estimate)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Production Weight (in T)</b>										
<b>Iron-base</b>	31,200	35,400	37,000	30,000	37,000	30,500	30,000	32,050	36,000	40,000
<b>Copper-base</b>	13,700	14,500	14,500	13,700	12,100	10,000	6,000*	7,250*	8,900*	10,200*
<b>Total</b>	44,900	49,900	51,500	43,700	49,100	40,500	36,000	39,300	44,900	50,200

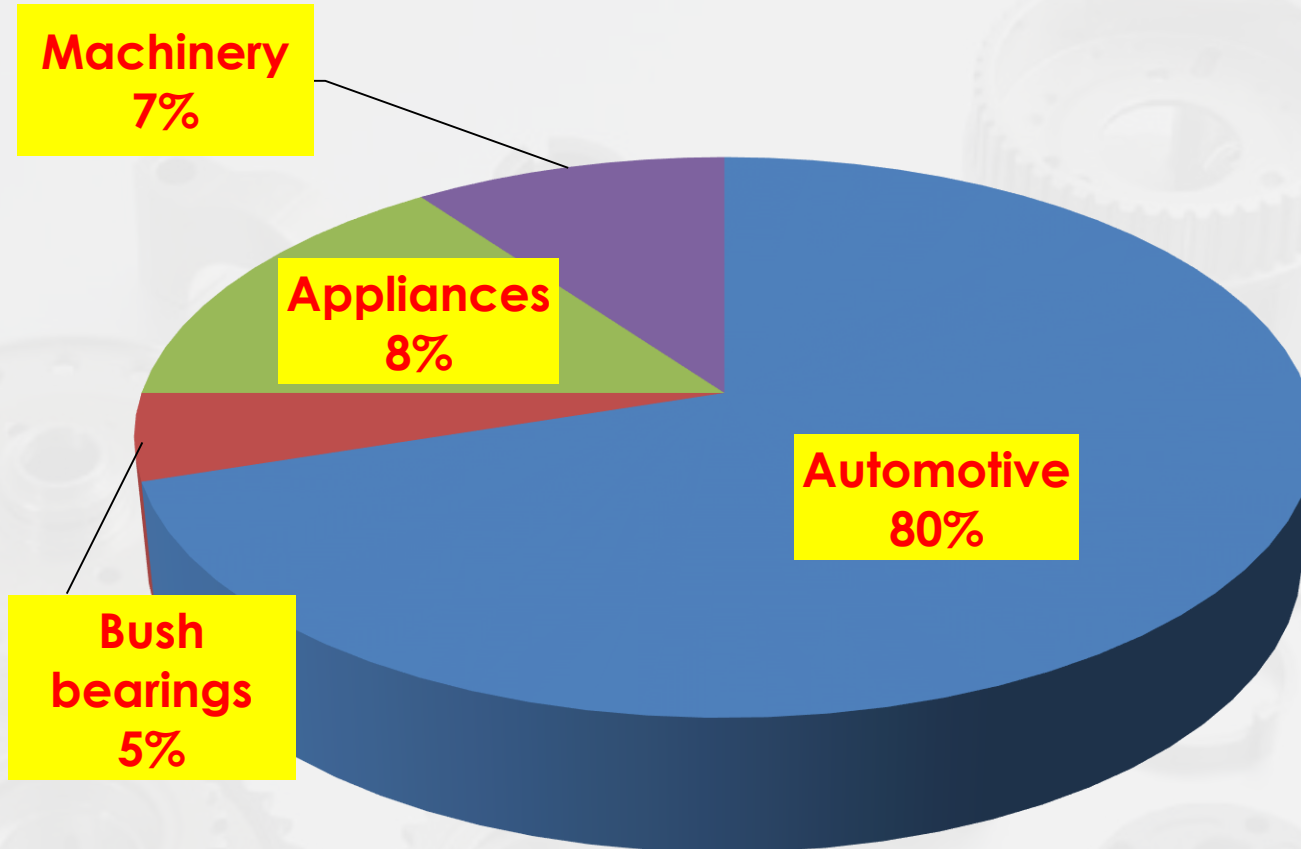
\* Non PM tonnage removed from 2016 onwards



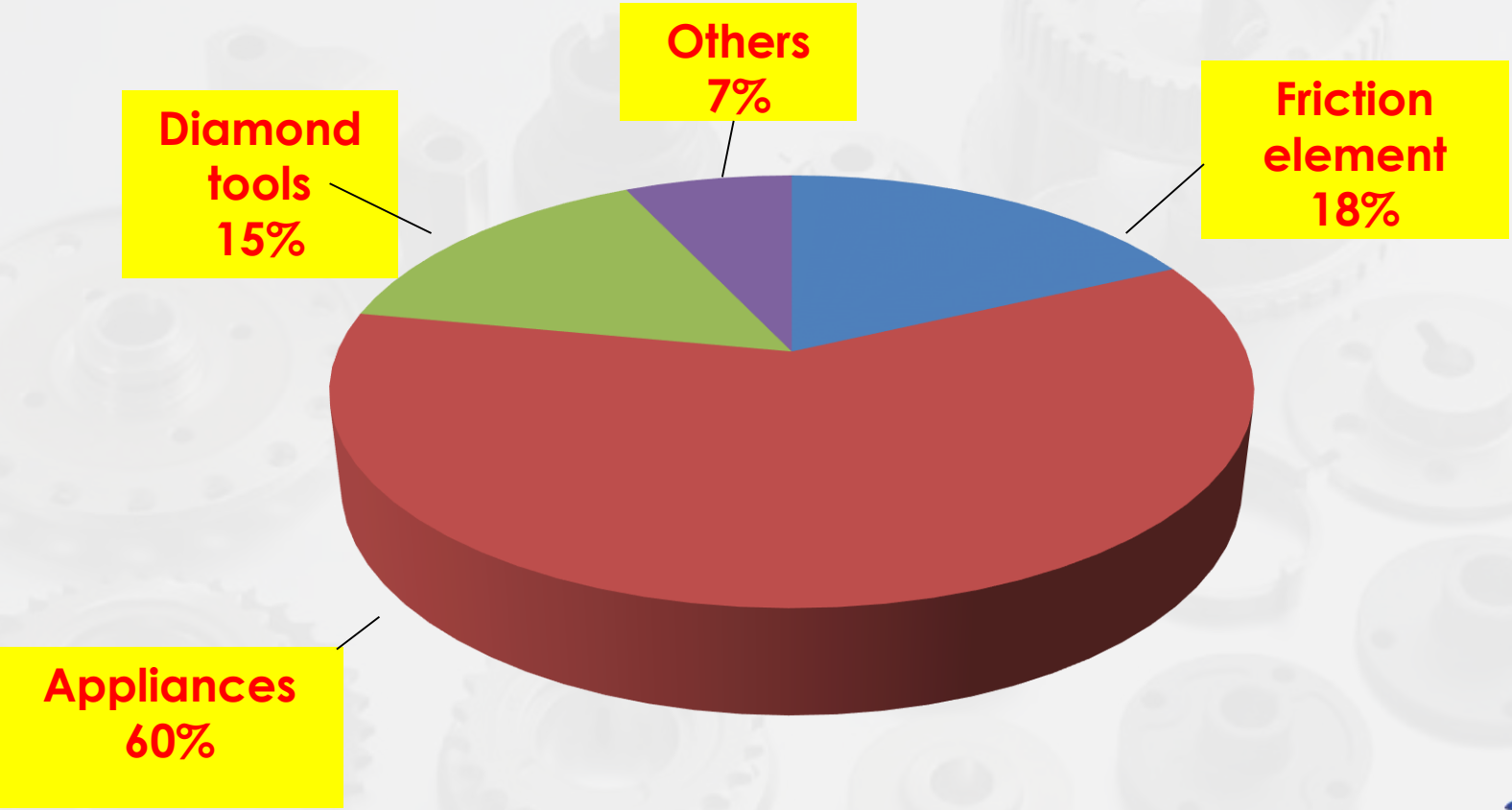
# Metal Powder Consumption by Industry



# Fe-based Market for PM Components in India



# Cu-based Market for PM Components in India



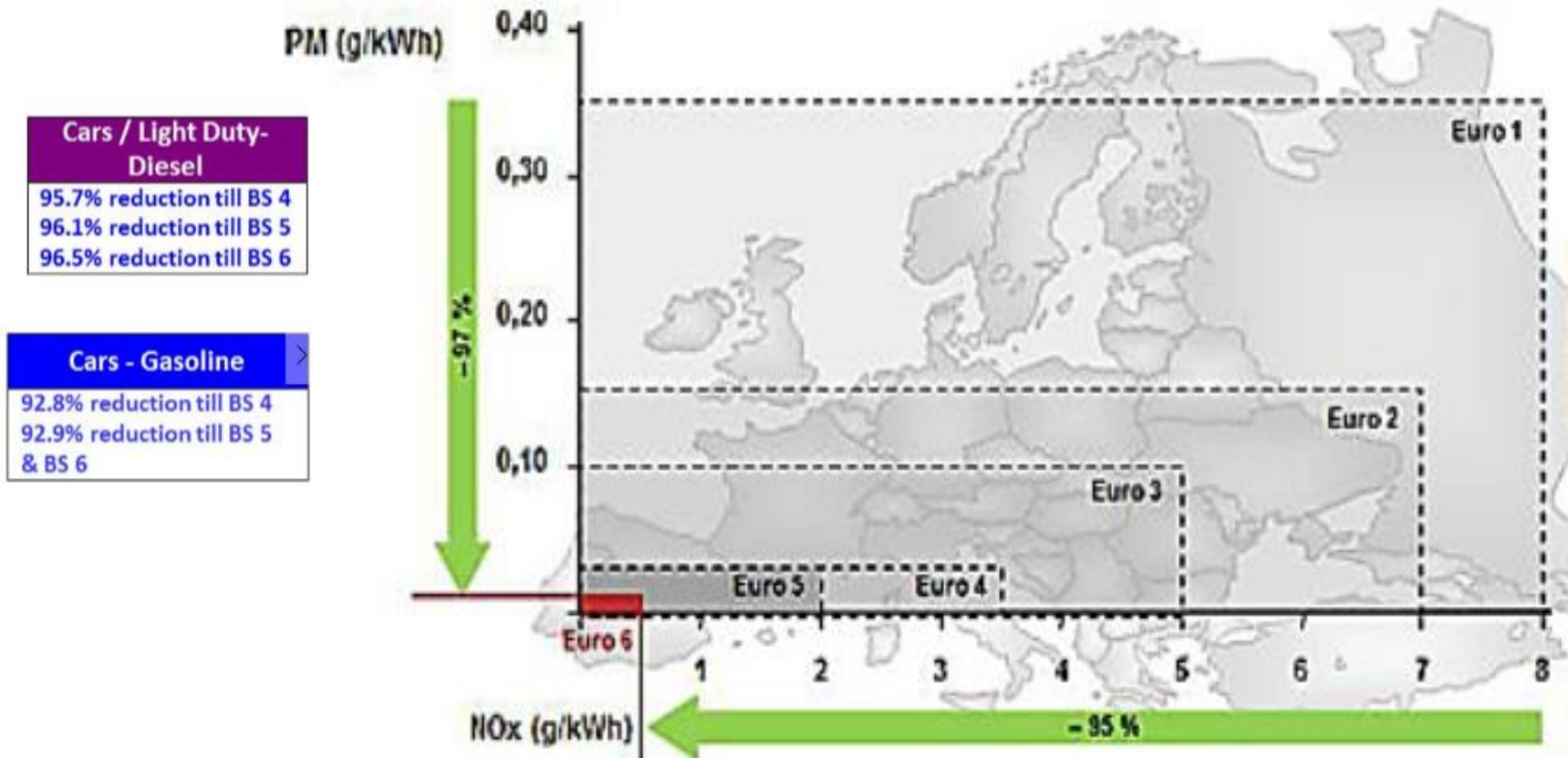


# Powder Metallurgy:

## Challenges:

- Transition:BS4 -BS6: Cost Increase
- COVID 19 (near term)
- ELECTROMOBILITY  
(medium to long term)

# India: Need for electromobility: Air Pollution Emission Reduction Roadmap



BS-IV TO BS-VI BY 2020

# Indian Government Looks to EVs/ Hybrid Vehicles to Address Air Pollution Problem



**Fame II – Rs. 10,000 Crore Sanction of Support from FY 20 to FY 22.**

**- Subsidy for 3 and 4 wheeler commercial vehicles.**

**July 2019: Government sanctioned 5645 public transport buses in 65 cities**

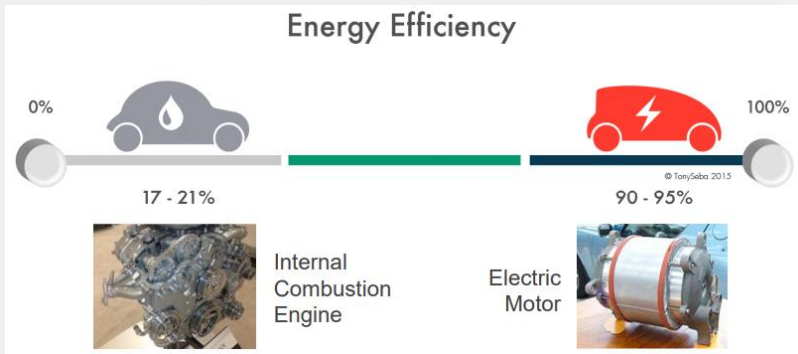
**Public Transport business case:  
Diesel: 110 Rs/ Km.  
EV: 50 Rs. / Km.**

EV sales volumes		
SIAM (units)	FY18	FY19
2Ws	54,800	1,26,000
4Ws	1,200	3,600
<b>Total</b>	<b>56,000</b>	<b>1,29,600</b>
3Ws (Estimated)		6,00,000

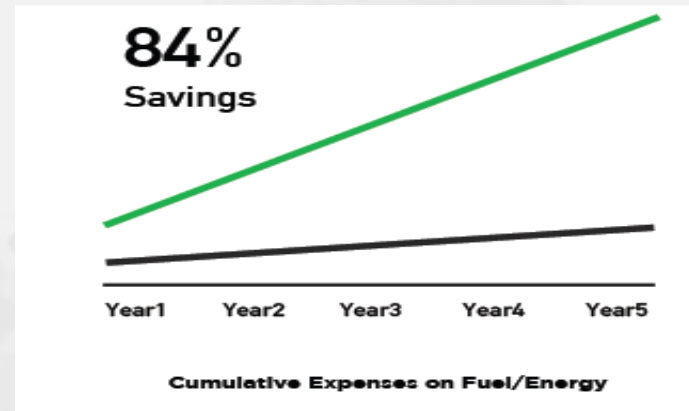


# Why EV's now

## EV's are 5x more energy efficient



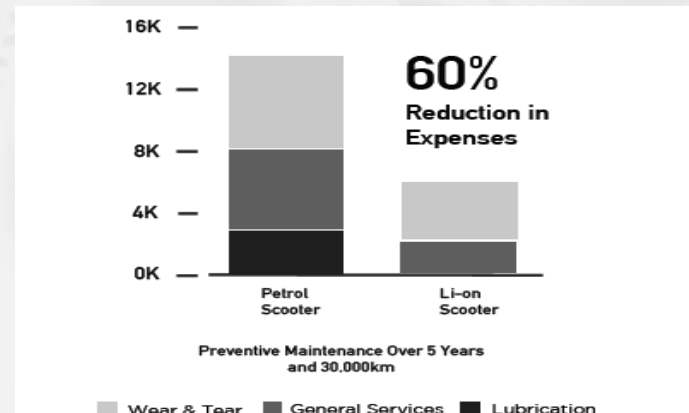
## EV's have 1/10<sup>th</sup> fuel energy expense:



## EV's: far lower moving parts than ICE



## Significantly lower Maintenance cost



# Why EV's now

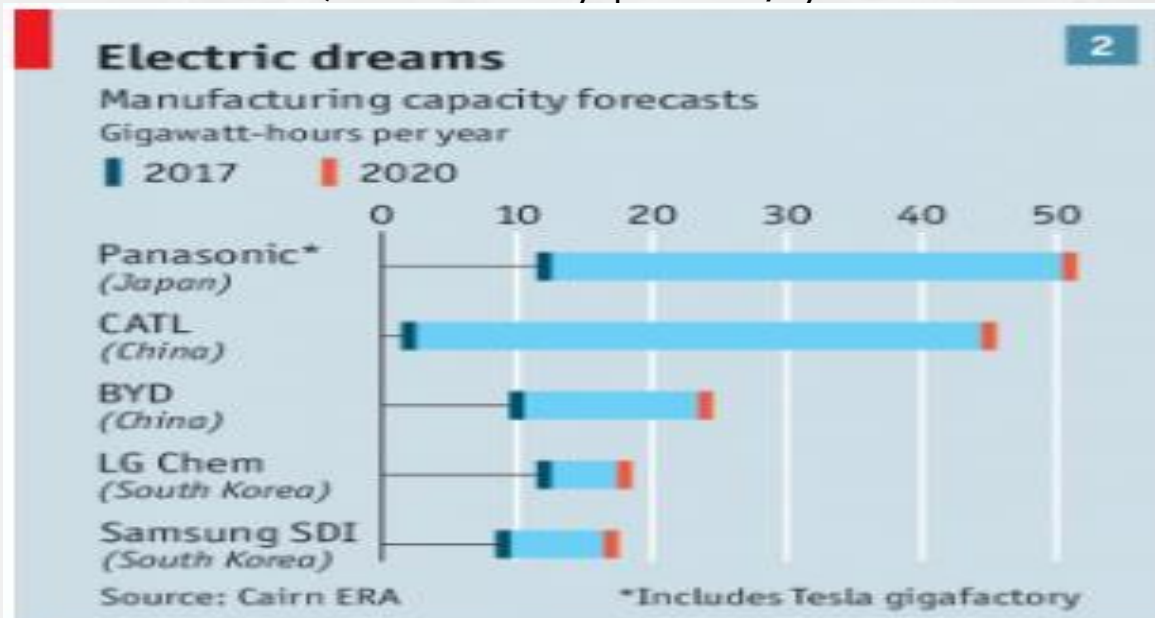
- Emission Norms getting stricter
- Exponential improvement in **battery technology** and **reduction in cost**:

1990: Energy Density – 90Wh/Kg – Cost 2000 USD/kWh

2019: Energy Density – 250 - 300Wh/Kg – Cost 200 USD/kWh

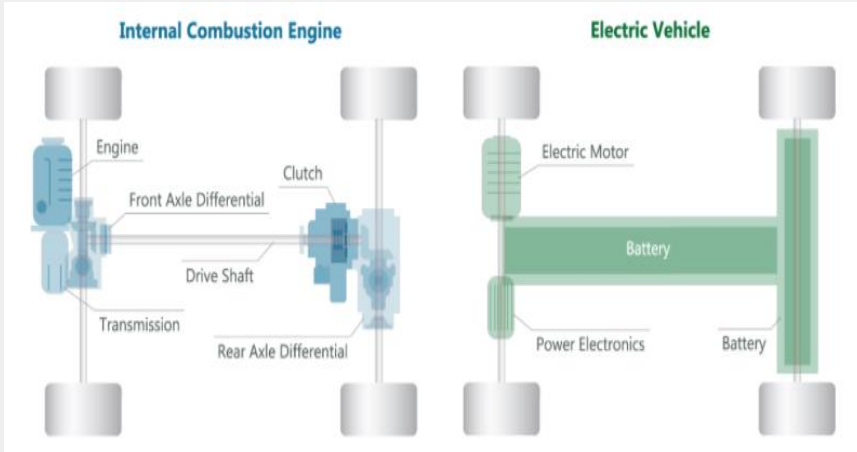
- **Production volume key factor in cost reduction**:

200,000 battery packs / year = Cost 200 USD/kWh or lower

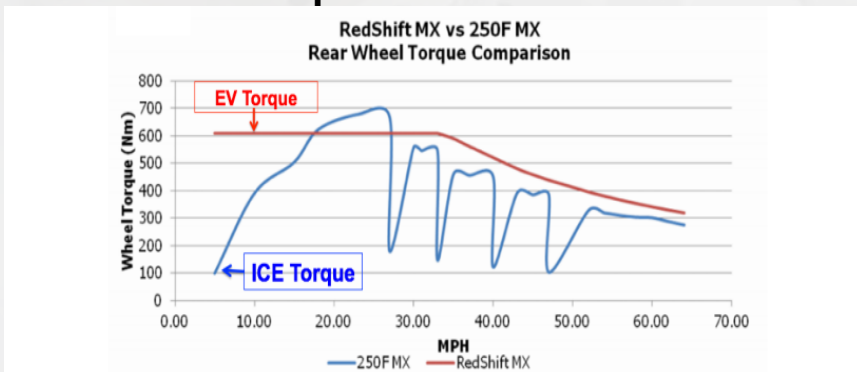


# Why EV's now

EV Powertrain much simpler than ICE Vehicle:

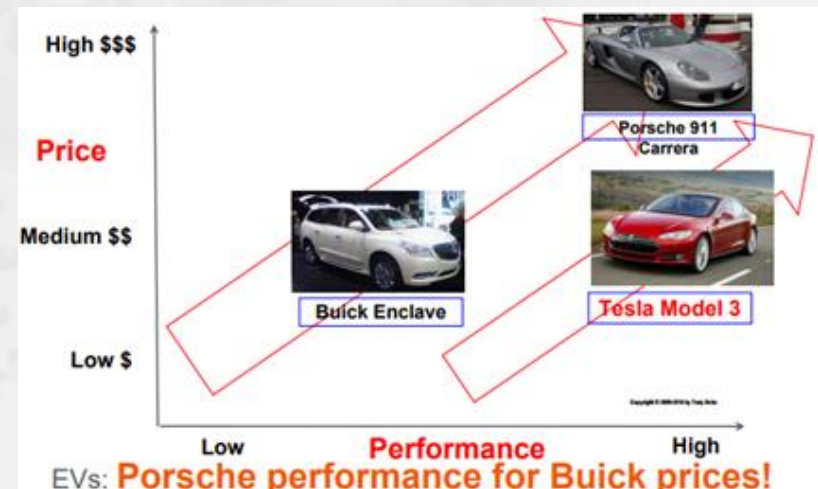


EV's: far more powerful than ICE:



“The Tesla P90D accelerates faster than \$1 million gas 'supercars' from Ferrari, McLaren, Lamborghini, Pagani and Porsche.” (1)

Tesla has disrupted the basis of competition:



# Global Charging Infrastructure: An Overview

Type	Time to full charge
Residential/Out of home AC charging	4-8 hours
Fast charging by DC current at public charging stations*	10 - 30 minutes
Battery swaps	5-10 minutes

Fast Charging standards	Supported by
CHAdeMO	Nissan, Honda, Toyota, Mitsubishi
Combined Charging System (CCS)	Volkswagen, General Motors, BMW, Daimler, Ford, FCA, Tesla and Hyundai
Tesla Supercharger	Tesla

Country	Fast Charging stations
US	5,500
China	80,000
Japan	5,500

Charging models possible in India under Electricity Act
Charging station set up by distribution licensee
PPP franchisee model
Battery Swapping

# Charging Infrastructure: India

- EESL Estimate: 2,000,000 EV cars need 400,000 EV chargers
- Currently India has 300 EV Chargers and 57,000 fuel pumps
- Lack of infrastructure and 3 different charging standards are a challenge
- Government reluctant to unify standards to early in innovation curve
- Charging requirements for 2w and 3w drastically different to 4w
  - 2w: home charging + battery swapping solutions.
  - 3w: Fleet Operated – private infrastructure
  - Backup infra required for 2w + 3w (emergency charging stations etc.)
- EESL Estimate 2030:
  - 79 million EV's (2+3+4w)
  - 08 million Charging Stations











**-FAME II – 2636 EV Charging stations in 62 cities – by March 2022**



# Charging Infrastructure: India

## Electric Vehicle Charging Stations

Company	Founded	Headquarters	Founders	Areas Of Interest
 <b>Volttic EV Charging</b>	2017	Noida	<b>Varun Chaturvedi, Surendra Pratap Singh and Shweta Chaturvedi</b>	Electric Vehicle Charging Solution, Cloud CMS and Mobile App for EV Charging
 <b>EVI Technologies</b>	2017	New Delhi	<b>Aditya Raj Verma and Vikrant K. Aggarwal</b>	Setting Up Of Public Electric Vehicle Charging Stations
 <b>eChargeBays</b>	2018	New Delhi	<b>Rajesh Singh, Amit Raju and Arun Yadav</b>	Setting Up Of Public & OEMs Charging Stations, Quick Chargers And Shared Charging Services
 <b>Energy Efficiency Services Limited (EESL)</b>	2009	New Delhi	<b>Gol</b>	Setting Up of Electric Vehicle Charging Stations, Energy Management
 <b>Micelio</b>	2018	Bengaluru	<b>Shreyas Shibulal</b>	Provides Electric Vehicle Incubation, Research Facility, Installs Charging Stations, Electric Vehicle Fund
 <b>Ather Energy</b>	2013	Bengaluru	<b>Tarun Mehta and Swapnil Jain</b>	Manufactures Electric Vehicles, Sets Up Electric Vehicle Charging Grids
 <b>Lithium Urban Technologies</b>	2014	Bengaluru	<b>Sanjay Krishnan</b>	Electric Vehicle Fleet Management
 <b>Magenta Power</b>	2015	Mumbai	<b>Maxson Lewis</b>	Installations Of Rooftop Solar Power Systems, Electric Vehicle Charging Solutions (ChargeGrid) and Energy Infomatlnics

# India Electromobility:

## E-Scooter at Cost Parity Already:

Particulars	2017			2020		
	Petrol Scooter	E-Scooter	E-Scooter (w/o subsidy)	Petrol Scooter	E-Scooter	E-Scooter (w/o subsidy)
On-road price (Rs, Mumbai)	65,000	85,000	1,07,000	70,000	64,000	86,000
LTV ratio (%)	75	75	75	75	75	75
Loan (Rs) 75% LTV	48,750	63,750	80,250	52,500	48,000	64,500
Interest Rate (%)	20	20	20	20	20	20
Loan tenure (months)	36	36	36	36	36	36
EMI (Rs)	1,812	2,369	2,982	1,951	1,784	2,397
Total interest cost	16,472	21,540	27,116	17,739	16,219	21,794
Total vehicle cost (incl. Interest)	81,472	1,06,540	1,34,116	87,739	80,219	1,07,794
Petrol or Charging cost/km	2.0	0.3	0.3	2.0	0.3	0.3
Annual Km Run	7500	7500	7500	7500	7500	7500
Annual Fuel Cost	15,000	2,357	2,357	15,000	2,357	2,357
Annual Maintenance Cost	4,000	2,500	2,500	4,000	2,500	2,500
Annual Insurance Cost 1%	650	1,275	1,605	700	960	1,290
Resale value after 5 years	32,500	25,000	36,000	35,000	21,500	32,500
5 yrs ownership costs (excl. battery)	1,47,222	1,12,201	1,30,426	1,51,239	87,804	1,06,030
Ownership cost/year	29,444	22,440	26,085	30,248	17,561	21,206
Annual Battery Costs (5 yrs assumed)	0	7,000	7,000	0	4,200	4,200
Total cost/km	3.9	3.9	4.4	4.0	2.9	3.4
Incr/(decr) over petrol variant (%)		-0.0	12.4		-28.1	-16.0



# India Electromobility:

**Fleet Taxis: Ownership cost could be 25% Lower by 2021:**

Particulars	2017 Diesel		2017 EV		2020 EV	
	Verito (personal)	Verito (taxi)	eVerito (personal)	eVerito (taxi)	eVerito (personal)	eVerito (taxi)
On-road price (Rs, Mumbai)	9,00,000	9,45,000	11,40,000	11,80,000	9,88,800	10,28,800
LTV ratio (%)	75	75	75	75	75	75
Loan (Rs) 75% LTV	6,75,000	7,08,750	8,55,000	8,85,000	7,41,600	7,71,600
Interest Rate (%)	12	12	12	12	12	12
Loan tenure (months)	60	60	60	60	60	60
EMI (Rs)	15,015	15,766	19,019	19,686	16,496	17,164
Total interest cost	2,25,900	2,37,195	2,86,140	2,96,180	2,48,189	2,58,229
Total vehicle cost (incl. Interest)	11,25,900	11,82,195	14,26,140	14,76,180	12,36,989	12,87,029
Diesel or Charging cost/km	3.9	3.9	1.5	1.5	1.5	1.5
Annual Km Run	10500	60000	10500	60000	10500	60000
Annual Fuel Cost	41,180	2,35,313	15,750	90,000	15,750	90,000
Annual Maintenance Cost	10,500	30,000	5,250	15,000	5,250	15,000
Annual Insurance Cost 1%	9,000	14,175	11,400	17,700	9,888	15,432
Resale value after 5 years	4,50,000	3,78,000	3,81,000	3,20,800	4,57,200	3,60,900
5 yrs ownership costs (excl. battery)	9,79,299	22,01,633	12,07,140	17,68,880	9,34,229	15,28,289
Ownership cost/year	1,95,860	4,40,327	2,41,428	3,53,776	1,86,846	3,05,658
Annual Battery Costs (5 yrs assumed)			80,000	80,000	40,000	40,000
Total cost/km	18.7	7.3	30.6	7.2	21.6	5.8
Incr/(decr) over diesel (%)			64	-1	7	-25

## Battery workings

Range on full charge (km)	100
Unit/full charge (Rs)	15
Electricity cost/unit (Rs)	10
Cost/km	1.50
Battery cost (Rs)	4,00,000
Battery life (years)	5
Annual battery depre. (Rs)	80,000



# India Electromobility:

## Planned Investments:

Sr. No	Company	Promoter	Ownership	Capacity per annum (units)		Rs Mn	
				Installed	Planned	Invested	Planned
	<u>Two - Wheelers</u>						
1	Hero Electric	Hero Electric	Promoter owned	1,00,000	5,00,000	3,543	7,000
2	Okinawa Scooter	Okinawa Auto Tech	Promoter owned	90,000	10,00,000	NA	2,000
3	Ampere Electric	Greaves Cotton	Subsidiary (100%)	60,000	NA	1,755	NA
4	Ather Scooters	Ather Energy Pvt Ltd	Promoter owned	30,000	5,00,000	6,750	6,000
		Hero Motocorp Ltd	Associate (32.31%)			2,010	
5	Tork Motors	Bharat Forge	Associate (48.86%)	30,000	NA	300	NA
6	Chetak Scooter	Bajaj Auto Ltd	Promoter owned	NA	NA	NA	NA
7	iQube Scooter	TVS Motors	Promoter owned	NA	NA	2,000	NA



# India Electromobility:

## Planned Investments: 3w, 4w, Public Transport, EV Components

<b>Passenger Vehicles</b>							
8	Mahindra Electric Mobility Ltd	Mahindra & Mahindra Ltd	Subsidiary (99.45%)	3Ws - 12000 4Ws - 6000 / 7200	NA	7,754	7500
9	Tata Autocorp	Tata Motors Ltd	Subsidiary (100%)		NA	NA	500
10	Hybrid Vehicle Manufacturing	Suzuki and Toyota Corp	Technical Tieup		NA	NA	NA
<b>Three Wheelers</b>							
11	Electric (3-wheeler)	Piaggio		0	NA	NA	NA
<b>Commercial Vehicles</b>							
12	Olectra Buses	Olectra Greentech (tieup with BYD)	Owned		1,000	3,500	2706
13	Tevva Motors (Jersey) Limited	Bharat Forge Ltd	Associate (35.26%)		NA	NA	89
<b>Auto Components</b>							
14	Automotive Electronics Power Pvt. Ltd (AEPPL)	Suzuki (50%) Toshiba (40%) Denso (10%)	Battery Joint Venture		NA	1GWh	1,215
15	Refu Elektronik, Germany	Bharat Forge Ltd (50%)	EV Component JV		NA	NA	890



# India Electromobility:

## Consensus View:

- Penetration of EVs in India to depend on:
  - Charging Infrastructure and Range
- Urban Transport: Car Fleets, Taxis, e-Rickshaws, e-autos, city buses, small CV's should be the first to convert to EV's
- Rate of shift in personal transport such as 2W and 4W, will depend on the mentioned factors above, as well as continued fall in battery prices.
- Key monitorable: Alternative Batteries/ Energy Solutions.
  - Questions persist about disposal of Li-Ion batteries which are hazardous to the environment.
- Commercial Heavy Vehicles will be the last to adopt e-mobility

# India Electromobility:

## Consensus View:

- Meaningful shift towards electromobility in India unlikely before 2025
  - Higher Upfront Costs
  - Range Anxiety
  - Lack of charging Infrastructure
  - Limited Product Offerings

### Potential EV Adopters:

- Public Transport
- E-rickshaws: Cost Economics highly attractive: Payback of 7 to 8 month

### 2 Wheelers:

- E-scooters: Cost economics already favourable, however:  
Poor Perception Early entrants offered poor (Pb-acid) products
- *Better Performance 2 Wheelers with innovative models could create inflection point over coming years.*
- Fleet Taxis:
  - Ownership cost already at parity with Diesel Power Train



# Powder Metallurgy: The way ahead:

- De-risking Product Mix
- New geographies
- New Applications – Non auto and E-mobility



# Acknowledgement:

Surjit Singh Arora:  
Fund Manager – PMS  
Tata Mutual Fund



All data presented herein is credible and source inputs can be provided.

For further inputs or copy of this presentation, please email me at:

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Thank you!!!

