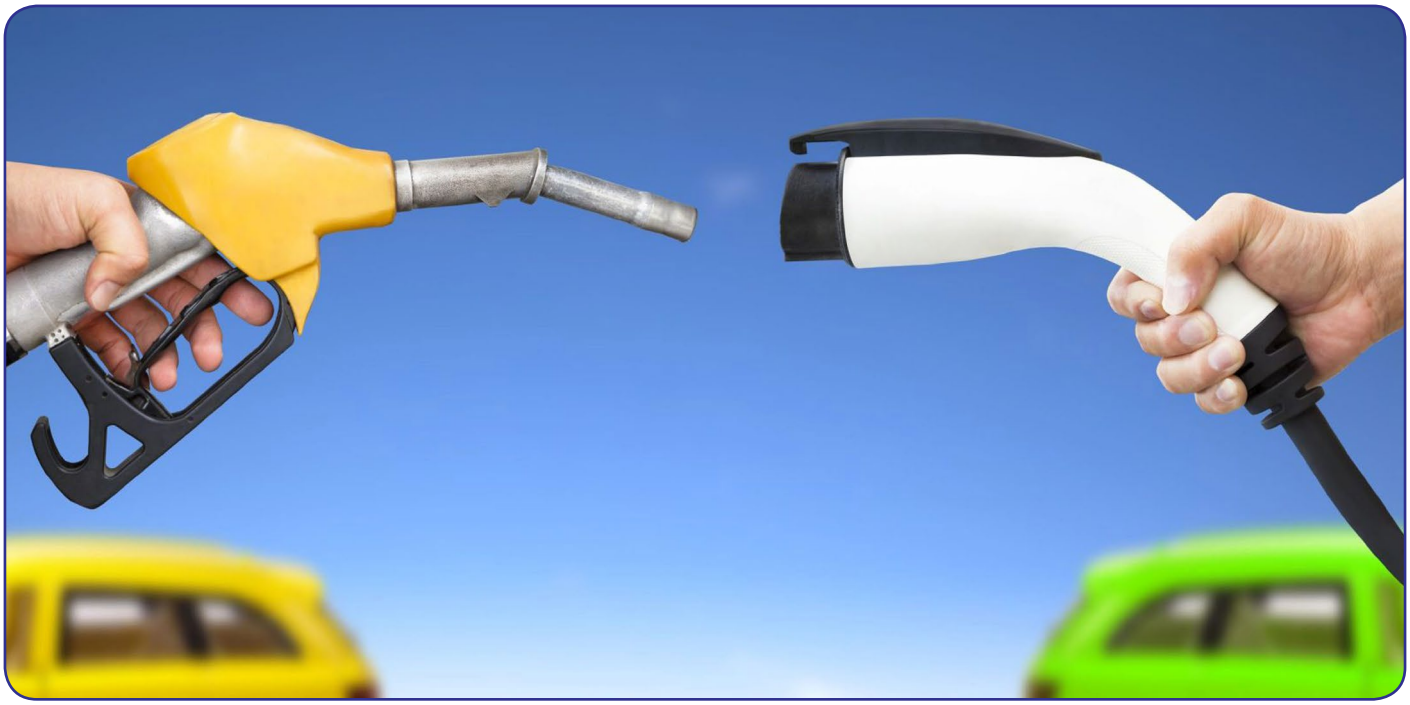
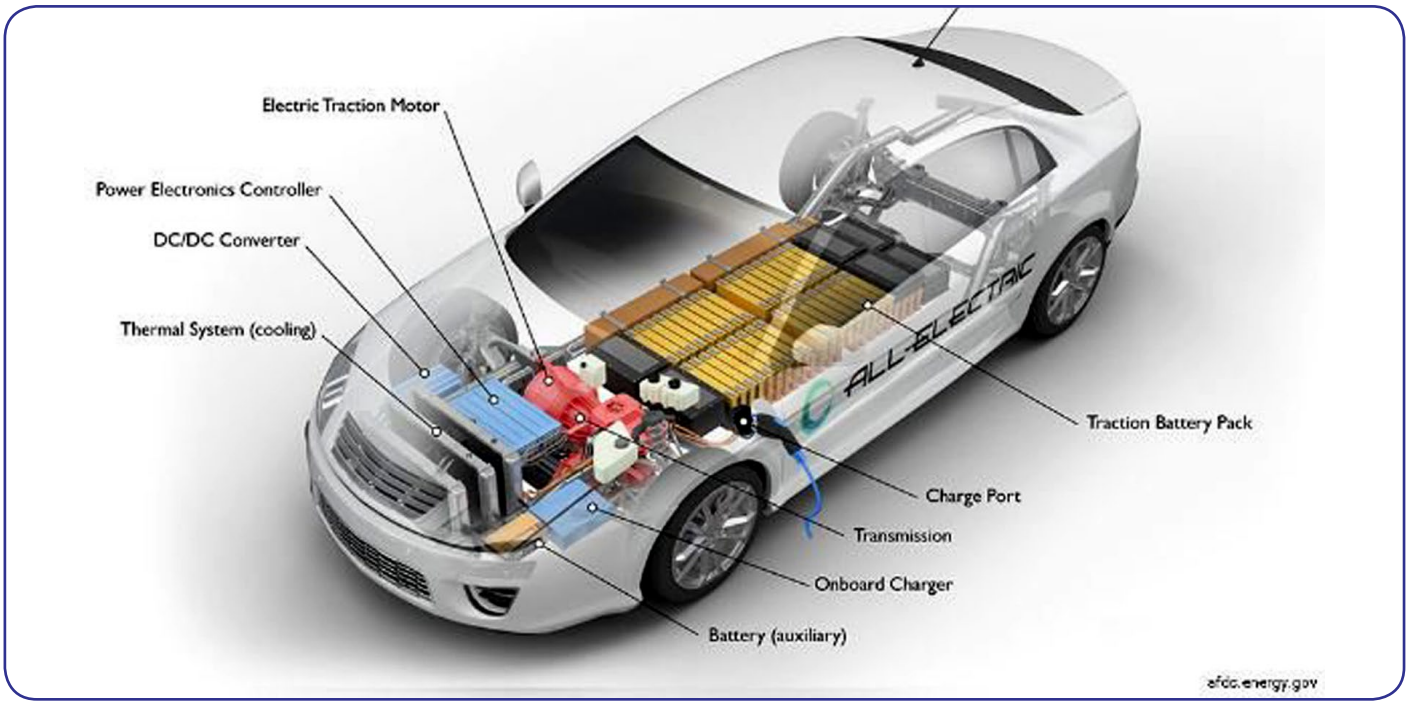
Auto – Electric Vehicles

Exciting times ahead for Electric Vehicles





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Executive summary

Exciting times ahead for Electric Vehicles

Global automotive industry is on the verge of disruption. Electrification, connectivity, shared mobility and autonomous driving is revolutionising automotive industry globally. Though, Electric Vehicles (EV) have been in the global market for last many years, definitive interest in EVs have sparked with the rise of Tesla Motors. Tesla is credited with proving that EV can be compelling and reliable form of personal mobility in a desirable package with capabilities on par or superior to those of comparable premium segment internal combustion engine (ICE) powered vehicles.

Global EV market: Poised for strong growth

Out of 92 mn light vehicles sold in 2016, Electric Vehicles is ~1%.

Significant shift to EV expected in Europe, US, UK and China

Stricter Emission regulation, drop in Lithium ion battery (LiB) cost, widely available charging infrastructure and increasing customer acceptance is expected to drive EV growth globally. Many developed countries (Germany, France, UK, Norway) have announced 100% shift to EVs by 2025/2040. China has announced aggressive policies to promote EVs. All the Global Auto OEM's are working on multiple EV platforms.

The EV market share in global light vehicle segment is expected to improve from current 1% to 8% by 2025 (26% CAGR), 24% by 2030 (24% CAGR) and 54% by 2040 (9% CAGR).

In the two-wheeler space, China is leading in electric two-wheeler globally and sold ~16 mn electric two-wheeler's in 2016 due to stringent emission norms.

Indian EV market: Everything needs to be done

Ambitious Target

Considering energy security, emission (As per World Health Organization, 10 out of world's 20 most polluting cities are in India and also 1.2 mn causalities in 2016 due to pollution) and to reduce oil import dependence, India has announced ambitious 100% EV adoption by 2030 (from current ~0%).

Massive investments and Policy framework holds the key

Lack of EV infrastructure and affordability are the key hurdles for EV in India. Massive investments will be required for establishing the EV infrastructure (primarily battery capacity and charging infrastructure) supported by policy frame work and India specific product development.

India will be announcing the comprehensive EV policy in December 2017.

Likely EV path in India: Three-wheeler ➞ Two-wheeler ➞ Intra city buses ➞ Taxis ➞ Private use cars

Considering total cost of ownership (TCO), market readiness, commercial operation feasibility, battery range and the (Likely) improvement in charging infrastructure, we believe the EV path in India will be Three-wheeler ➞ Two-wheeler ➞ Intra city buses ➞ Taxis ➞ Private use car.

Improvement in charging infrastructure and drop in LiB price to drive EV transition

We expect meaningful EV penetration in three-wheeler by 2019 (by the organised players); in two-wheeler, Intra city buses and Taxis by 2020/2021 and Private use cars by 2025.

Though, Tesla has recently demonstrated EV truck (Tesla Semi), considering higher battery capacity requirements due to high payload, daily long distance travel and lack of

battery charging infrastructure in high ways, we believe heavy commercial vehicle will continue to remain ICE in the near future.

We expect tractors to remain ICE due to charging infrastructure constraints and power situation in rural.

Overall, though India is targeting 100% EV by 2030, based on our discussion with auto industry experts, we believe EV penetration in India can be 20-25% by 2030.

Auto OEM: Maruti, M&M and TVS may have early entrant advantage

Considering the global developments in EV space and the Indian Government drive towards EV, all the Indian auto major OEM's are now working on EVs, not to lose out on emerging opportunities.

Maruti: Parent Suzuki Motor Corporation (SMC), Japan is establishing a LiB battery plant in Gujarat in Joint Venture with Denso and Toshiba, with an investment of Rs 11 bn and is expected to be in operation by 2020. Maruti/SMC has plans to export Hybrid/ Electric Vehicle from Gujarat. SMC has signed a MOU with Toyota, Japan and Toyota will provide technical support to Suzuki to produce Electric Vehicles in India by 2020.

TVS Motor: TVS Motor will be launching a Hybrid two-wheeler in December 2017 and an Electric two-wheeler by March 2018. TVS Motor will be importing battery cells and will be assembling the battery in-house. TVS has also developed its own battery management system and motor design.

All major OEMs have began charting thier EV plans

Bajaj Auto: Bajaj Auto has announced launch of Electric three-wheeler in 2018 and Electric two-wheeler in 2020. The challenge for Bajaj Auto will be to maintain high domestic market share (59%) and profitability (EBITDA margin of ~30%) in electric three-wheeler. On two-wheeler, EV may provide opportunity for Bajaj to enter scooter market (Urbanite brand).

Hero MotoCorp: Hero MotoCorp has 30% stake in Ather Energy, a start-up in Bengaluru working on eScooter (S340). Hero MotoCorp is also working on its own Electric two-wheeler and is expected to launch the vehicle in 2020. The challenge for Hero MotoCorp will be to design an electric motorcycle for mass commuter market and defend high market share. However, the rural is expected to be ICE dominant for more time due to charging infrastructure and power constraints.

Also, our understanding is that there is design challenges in accommodating electric motor, battery and control systems in a commuter motorcycle frame.

Eicher Motors: We expect leisure biking to be ICE dominant in the near future.

Mahindra & Mahindra: M&M is the only company which has been selling lithium ion electric cars for the last many years (e20 plus and eVerito) and the company has sold ~2K vehicles in 2016. M&M has entered into strategic alliance with Ford to work together on many areas, including EVs. M&M is also working on electric three-wheeler, two-wheeler and LCV's. Has already launched electric three-wheeler e-Alfa in India and two-wheeler GenZe in the US market. With Government thrust on EV, M&M can improve market share in auto segment.

Ashok Leyland: AL has developed Electric bus "Circuit" and UK subsidiary Optare already manufactures Electric Buses. Ashok Leyland has strategic alliance with Sun Mobility for Electric Mobility solutions.

Tata Motors: Tata Motors is working on electric buses and electric cars in collaboration with Tata Motors European Technical Centre (based in University of Warwick in UK). Tata Motors has received order from EESL recently for supply of 10,000 vehicles, with first phase supply of 250 vehicles in December 2017. JLR will be launching their first EV I-PACE in 2018. However, globally, peers are planning many aggressive launches.

Auto component companies: Engine & Transmission component companies to have significant impact

The transformation from ICE to EV is expected to have significant impact on the auto component industry. Engine, transmission and exhaust system in a conventional ICE vehicle will be replaced by battery, electric motor, inverter and control system in an Electric Vehicle.

The following impact analysis is based on current product portfolio of the auto component companies. Going forward, the companies can diversify into EV components.

Engine and transmission component companies with significant exposure to Indian three-wheeler and two-wheeler markets to be most impacted

The impact will be high for auto component companies like **Federal Mogul, SamKRG Piston, Ucal Fuel System, India Nippon and Talbros Automotive Components** manufacturing primarily ICE related components.

Precision Camshafts and Igarashi Motor is expected to have significant impact, as their current product is primarily ICE related and also both companies predominantly export to global passenger car market where we expect EV transition to happen faster.

Since transmission will get simpler in EV, **Shivam Auto Tech** and **Hi Tech Gears** may have impact due to less content per vehicle.

Amara Raja and Exide currently manufactures only lead acid batteries and 60-65% of revenue is from automotive. Both companies are now working on LiB batteries. No significant impact expected in the near-term. Though electric cars and buses have auxiliary lead acid batteries, the prime power source will be LiB batteries. With major OEM's like Maruti (Suzuki), TVS and M&M establishing their own LiB battery manufacturing/ assembly facilities, the current near duo play in lead acid battery market (AMRJ and Exide) will be under threat in the long-term.

As EV does not require lubricants like engine oil, the lubricant companies like **Castrol** will have impact on long-term, as the Electric Vehicle park increases.

The key product of **Bosch India Limited** – Fuel injection system is completely dependent on ICE. However, CV, Tractor, after-market and non-auto contribute ~80% of revenue for Bosch and will not have impact on EVs in the near future. On electric two-wheeler, Bosch has significant presence in China and also Bosch Global is associated with global major OEM's for electric PV's. Considering expertise of Bosch Global in EV space, we believe EV will open up significant opportunities for Bosch in India. Bosch is already working with domestic OEM's on electric two-wheeler and three-wheeler in India and the company has announced that Bosch will serve EV space in India through the listed company.

For **Bharat Forge,** non-auto and supply to CV segment is not expected to be impacted by EVs in the near to medium-term. Supply to PV's (~15% of revenue) to be impacted by EVs.

Management has indicated that the company is already in discussion with global OEM's for supply of forged and machined components for EVs.

Companies like **Sundram Fasteners, Bearing companies, Mahindra CIE, Tube Investment, Minda Industries, Endurance Technologies, Sundaram Clayton, Rico Auto, Lumax Auto Technologies, Minda Corporation, MM Forgings, Rane Holding, Tube Investment, Banco Products and Pricol** is likely to have medium impact, as part of their current product portfolio will be impacted by EVs.

Tyre companies (MRF, Apollo, JK Tyres, CEAT, Good Year), Lighting companies (Lumax Industries, FIEM Industries), Shock Absorber companies (Gabriel, Munjal Showa), Sona Koyo Steering, Suprajit, Wheels India, Jay Bharat Maruti/JBM Auto, Subros, WABCO India, Asahi India Glass, Bharat Seats, PPAP Automotive are neutral to power train and hence no significant impact due to EVs.

For **Motherson Sumi,** polymer business, rear view mirror and wiring harness is neutral to power train. Light weighting and increase in wiring harness content in EVs will be structurally positive for Motherson.

We do not expect significant impact for **Automotive Axles, Jamna Auto, Setco Automotive** and **GNA Axles**, as we expect MHCV segment to be ICE dominant in the near future.

JBM Auto has tied up with Solaris, Poland to design and develop Electric and Hybrid buses for India.

Adaptation to EV and innovation is of paramount importance

On export to global EV market, there is no significant export from India now, as the global EV market is small. Considering the growth potential in global EV space, many Indian auto component majors are now exploring supply of structural components for global EV. **Sundram Fasteners** has already started supply of Bevel Gear and surge tank cap to Tesla. **Motherson's** overseas subsidiaries (SMR & SMP) are already supplying EV parts to Tesla, Renault Nissan, BMW & General Motors.

In the EV space, new opportunities lies in parts like LiB battery, motor, controllers and micro-processors and may throw up new winners in auto component space as EV picks up.

Impact on other sectors

EVs can cause job losses in ICE vehicles related auto ancillary companies. Also, due to lower maintenance requirements of EVs, it could affect after-sales service networks and unorganised mechanics.

EVs will have negative impact on Oil & Gas companies and positive impact on power generation companies/grids, electric motors and electronic component manufacturing companies, charging infrastructure companies and LiB battery manufacturing companies.

On the metals side, demand for Steel, Lead and Platinum is expected to drop and demand for Graphite, Nickel, Aluminium, Copper, Lithium, Cobalt and Manganese expected to go up.

How to play the theme

As EV industry is just evolving in India and also as most of the companies are yet to announce their concrete EV plan, we have refrained from taking a definitive view on the financial impact for the companies on EV transition.

However, we screen the companies based on their announced EV plan, financial strength to access technology, nature of their current product profile, and technology support from parent.

We believe the following companies can have positive traction on EV Transition:

Positive measures to combat EV threat

Maruti Suzuki: LIB Battery plant in Gujarat, Technology support from Toyota

Mahindra & Mahindra: Early entrant in EV, developing EV products across segments, (Likely) technology support from Ford.

TVS Motors: Ahead of peers in EV development

Motherson Sumi: Light weighting and increase in wiring harness to be structurally positive. Motherson already supplies parts to EV vehicles of Tesla, Renault Nissan, BMW and GM

Bosch: Access to high end global EV mobility

Sundram Fastners: Already supplying Bevel Gear and surge tank cap to Tesla

Based on current product profile, we suggest investors to keep track of developments in the following companies:

Exercise caution and watch out for developments

Precision cam shaft: Export player. EV transition in global PV market to impact precision cam shaft as cam shaft not required for EVs

Igarashi Motor: Export player. EV transition in global PV market to impact Igarashi motor as Electronic throttle control motors are not required for EVs

Amara Raja & Exide: OEMs like Maruti (Suzuki), TVS Motor, M&M are establishing their own Battery manufacturing/assembly plants – Threat in long term.

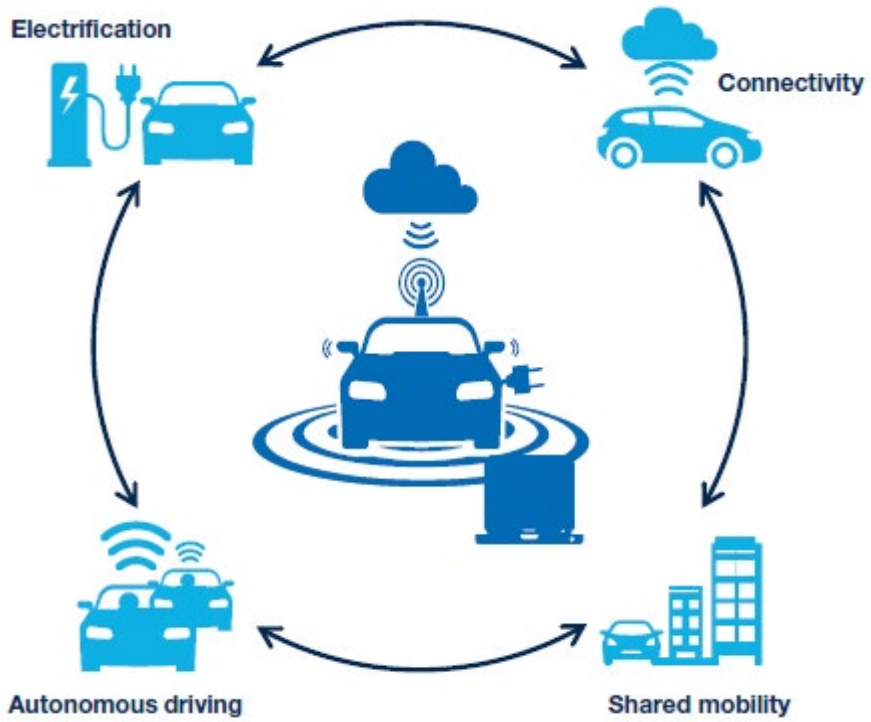
Castrol: Long term threat, as Lubricants (Engine oil) is not required for EVs.

The current product profile of **Federal Mogul, SAM KRG Piston, India Nippon Electricals, Ucal Fuel systems, Talbros automotive components** is predominantly IC Engine related and may have to diversify to EV related components.

Electric vehicles

Global automotive industry is on the verge of disruption. Electrification, connectivity, shared mobility and autonomous driving is revolutionising automotive industry globally. These trends is expected to shift markets and revenue pools, change mobility behaviour and build new avenues for competition and cooperation.

Global Auto Trend



Source: McKinsey

Tesla – The game changer for EV

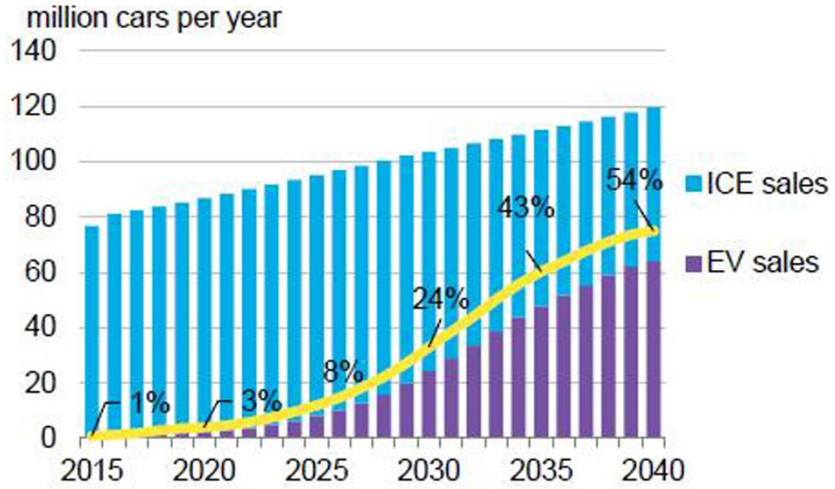
Though Electric Vehicles have been in the global market for last many years, definitive interest in EVs has been sparked with the rise of Tesla Motors. Tesla is credited with proving that EV can be compelling and reliable form of personal mobility in a desirable package with capabilities on par or superior to those of comparable premium segment internal combustion engine (ICE) powered vehicles. Over the years, launch of Model S and improved offerings from other OEMs have had favourable impact on EV.

Stricter emission regulation, drop in battery cost, more widely available charging infrastructure and increasing customer acceptance is expected to support EV growth globally.

Global EV growth estimated at 26% CAGR for next 15 years

Out of 92 mn light vehicles sold globally in 2016, ~700K vehicles (~1%) is Battery Electric Vehicle (BEV) & Plug in Hybrid Electric Vehicle (PHEV). On expected drop in Lithium Ion (LiB) battery price, more models for buyers to choose from stricter emission regulation and Government initiatives, the global EV market share (in light vehicle) is expected to sharply improve from current 1% to 8% by 2025 (26% CAGR), 24% by 2030 (24% CAGR) and 54% by 2040 (9% CAGR).

Annual Global Light Duty Vehicle Sales Estimate



Source: Bloomberg new energy finance

In the two-wheeler space, China is leading in electric two-wheeler globally and sold ~16 mn electric two-wheeler in 2016, due to stringent emission norms.

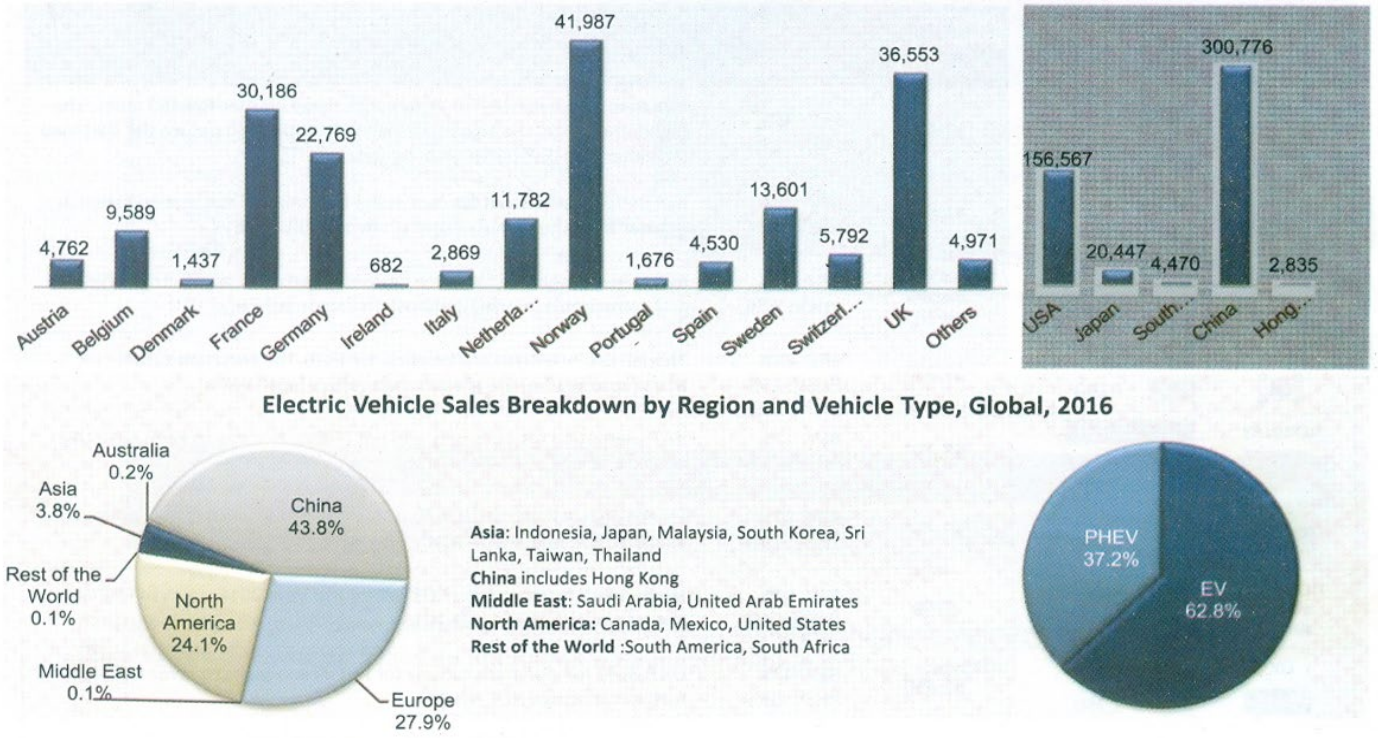
Ambitious target by India

Considering energy security, emission (As per World Health Organization, 10 out of world's 20 most polluting cities are in India and also 1.2 mn causalities in 2016 due to pollution) and to reduce oil import dependence, Indian government has announced ambitious 100% electric vehicles by 2030 (from current ~0%).

Global EV market

Out of 92 mn light vehicles sold globally in 2016, ~700K vehicles is electric vehicles (EV)/ Plug in Hybrid Vehicles (PHEV) and China leads with 300K vehicle sales (43.8% share).

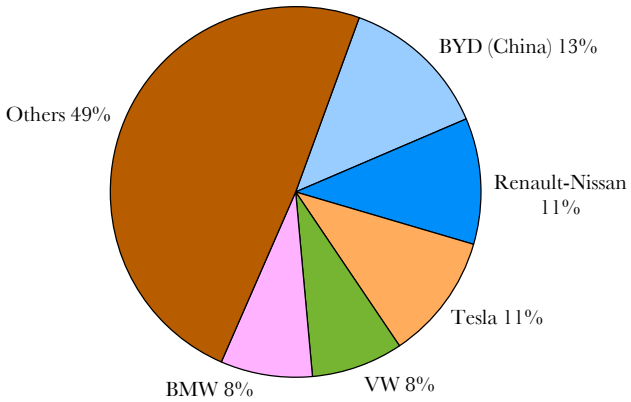
Electric Vehicle Sales by Country, 2016



Source: Industry

Considering the global shift towards EV, the global major OEMs are now working on EVs with multiple platforms. In 2016, the EV market was led by BYD (China), Renault Nissan and Tesla leading the market share in 2016.

EV – Global market share 2016



Source: Industry, B&K Research

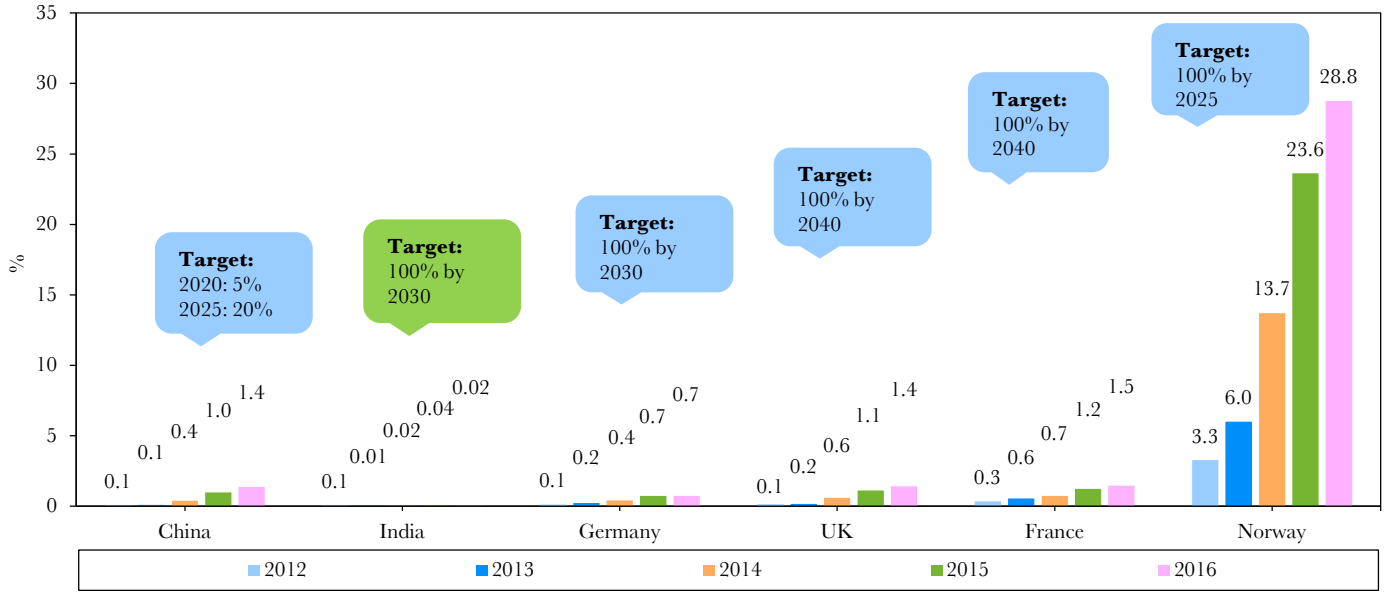
Model-wise, the largest selling model in 2016 is Tesla Model S (52,579), followed by Nissan Leaf (47,662), BYD Tang (28,895) and Chevrolet Volt (28,297).

Going forward significant competition expected globally in EV

From the current ~1%, global light vehicle EV market share is expected to grow to 8% by 2025, 24% by 2030 and 54% by 2040 on lower battery cost, incentives, widely available charging infrastructure, launch of new models by various players and increasing customer acceptance.

For environmental reasons, many countries have announced significant EV targets

EV Global Penetration & Target



Source: IEA (International Energy Agency)

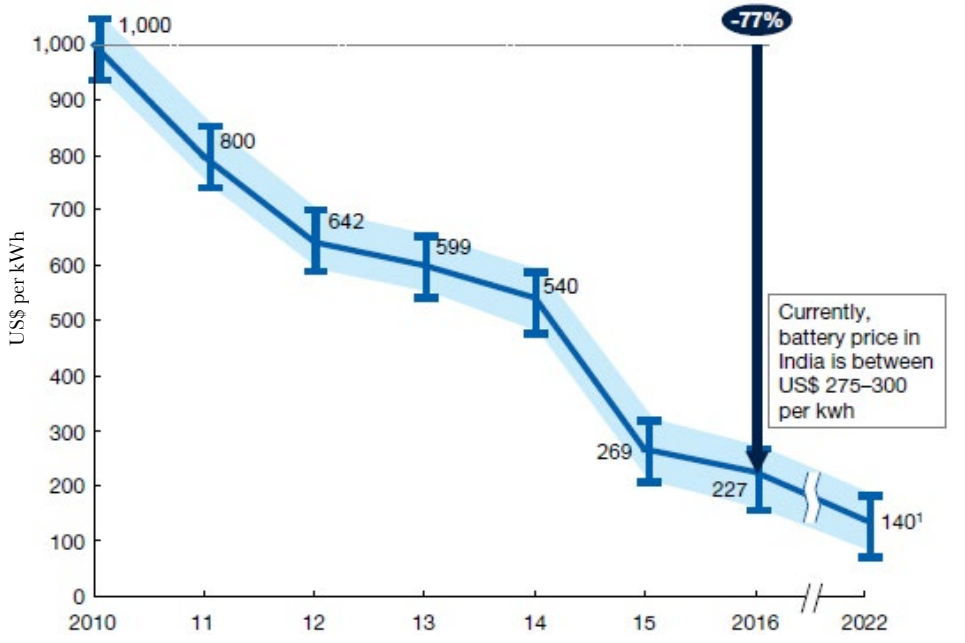
LiB battery cost

Lithium Ion batteries (LiB) is the widely used energy source in Electric Vehicles globally and currently contribute ~35% of total electric vehicle cost. Due to higher energy density and technology advancements, the LiB battery price has been dropping sharply and is a driving factor on growth of Electric Vehicles globally.

The cost of LiB batteries has dropped from US$ 1,000 per kWh in 2010 to US$ 200-250 per kWh now. It is expected to further drop to below US$ 140 levels by 2022 due to scale, technological advances and sharp increase in battery energy density.

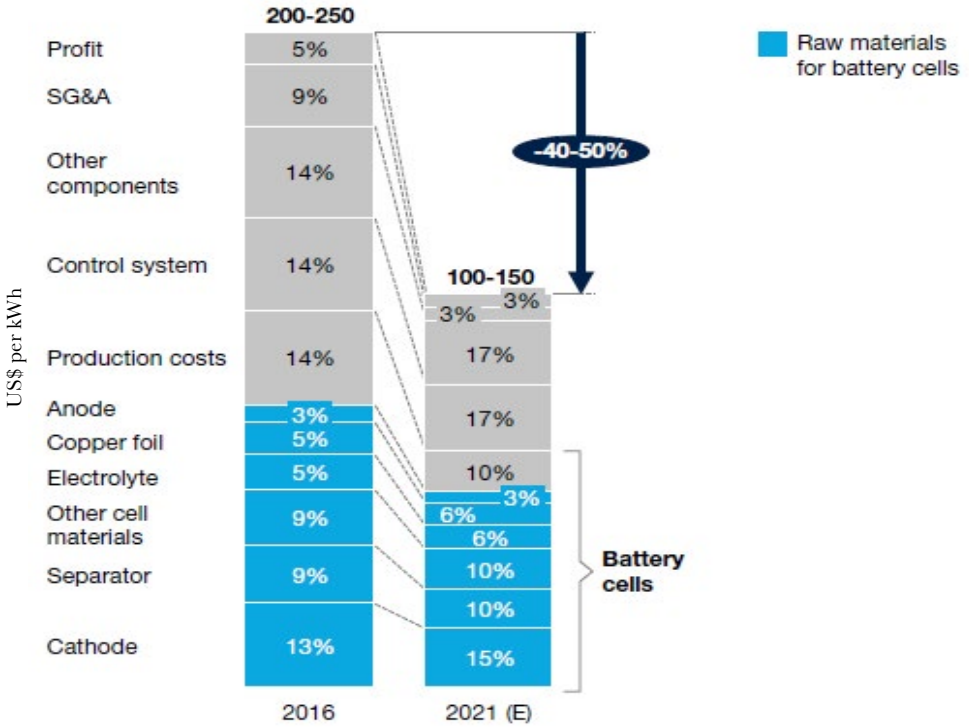
Significant drop in LiB battery price

Weighted average battery pack price and indicative ranges (US)



Source: Industry, B&K Research

Price breakup for Lithium batteries

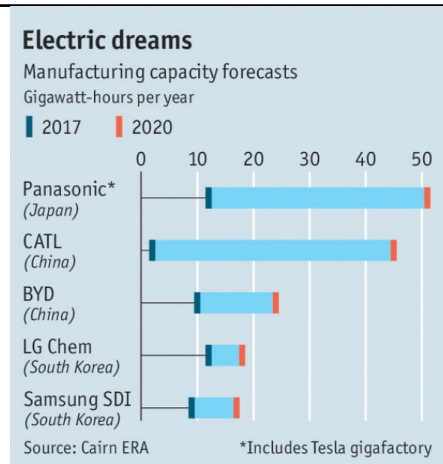


Source: Industry, B&K Research

LiB battery – capacity expansion

Considering the expected global shift towards EV, the leading global Lithium Ion battery players – Panasonic, CAIL (China), HYD (China), LG CChem (South Korea) and Samsung (South Korea) are expanding capacity multifold.

Battery capex plan of global majors



Source: Cairn ERA

Giga LiB battery facilities are being established globally

Significant technology development is now happening in LiB battery and many companies including Toyota is working on solid state batteries which could significantly improve the energy density and also eliminate the liquid electrolyte thus making the battery pack safer and more efficient.

Currently, India does not have LiB battery capacity and massive investments will be required.

Incentives

Incentives to be phased out on drop in LiB prices

Due to higher battery cost, the purchase cost of EV is expensive to ICE globally now. Considering the purchase cost difference between ICE and EV vehicles, purchase incentive of US$ 1,250 to 10,000 per vehicle for Battery Electric Vehicles (BEV) and Plug in Hybrid Electric Vehicle (PHEV) is being offered by various countries to promote EVs.

Electric Vehicle Incentives in 2015

Country	Est. purchase incentive (USD)*	Incentive Difference (BEV-PHEV)	Sales Shares	Prospects for Incentives
CHINA	10,000 / 6,500	$3,500	BEV: 65% PHEV: 35%	Incentives are available for PHEVs with range greater than 50 miles. The higher the range, the bigger the incentive. China will reduce the purchase incentive of PHEVs by 5% year-on-year.
US	8,750 / 4,750	$4,000	BEV: 62% PHEV: 38%	Incentives to phase out for cars at the beginning of the second calendar quarter after the manufacturer produces 200,000 EVs.
JAPAN	5,500 / 3,000	$2,500	BEV: 50% PHEV: 50%	Incentives depend on the price difference between an electric vehicle and comparable internal combustion engine vehicle.
S.KOREA	16,550 / 7,200	$9,350	BEV: 85% PHEV: 15%	Though tax incentives are identical for both, the purchase subsidy for BEVs (upto ₩12m) are greater than PHEVs (upto ₩5m).
NORWAY	20,000 / 11,750	$8,250	BEV: 77% PHEV: 23%	VAT exemption for BEVs only and not PHEVs. Norway to keep incentives till 2020 to stay as EV leader (to be reviewed in 2018).
FRANCE	7,100 / 1,250	$5,850	BEV: 81% PHEV: 19%	France hugely favors BEVs with its high purchase subsidy. Incentives are expected to remain until 2020.
HOLLAND	6,500 / 6,250	$250	BEV: 10% PHEV: 90%	Netherlands increased the CO2 tax for PHEVs in 2016; sales of PHEVs reduced to one-third in H1 2016.
UK	6,200 / 3,750	$2,450	BEV: 42% PHEV: 58%	UK halved the purchase subsidy for PHEVs and plans to favor BEVs by further reducing PHEV rebates.

BEV PHEV

*Reference taken from IEA Global EV Outlook 2016

Source: IEA, B&K Research

In most of the developed countries, the incentive is expected to remain until 2020 and then gradually phased out by 2025, by which time the cost of Electric Vehicle is expected to match IC vehicle price due to drop in LiB battery prices.

Charger types and global charging infrastructure

Types of EV chargers

The EV chargers is broadly classified into three types:

Level 1: Also called as "slow chargers" and it is just plugging into a standard electrical outlet. Can cater to overnight charging needs of Electric two-wheeler, three-wheeler and passenger car.

DC fasting charging can charge 80% of battery capacity in 20 minutes

Level 2: Also called as fast chargers and most public charging stations globally are Level 2 chargers. Current cost of Level 2 chargers is US$ 600 to US$ 1,000.

DC fast: Unlike Level 1 and Level 2 chargers, the conversion from AC to DC happens in the charging station in DC fast chargers. This allows DC chargers to supply more power and charge vehicles faster. Depending upon the specification, the DC fast charger cost varies between US$ 10,000 to 40,000.

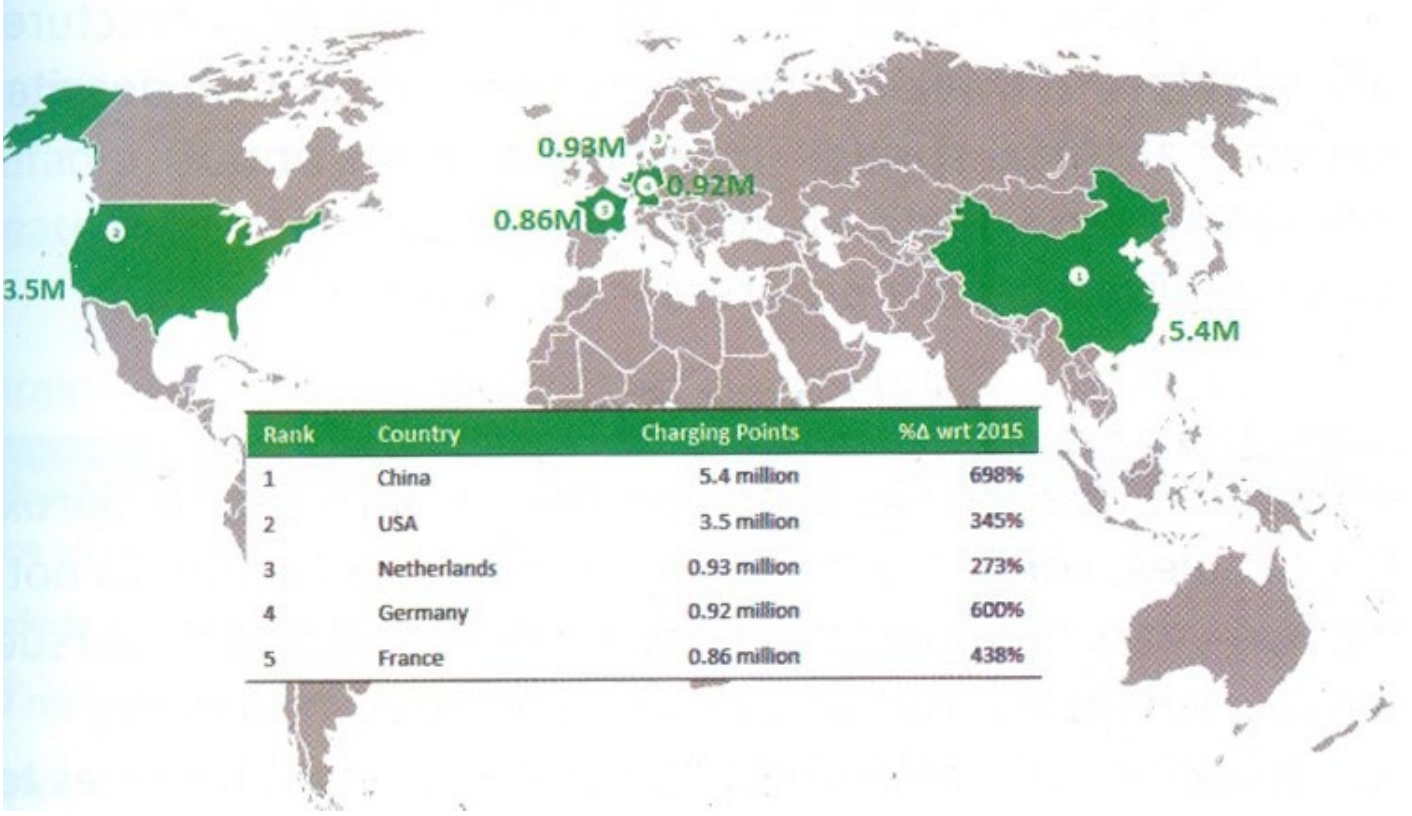
Typical time to charge the battery by charging type

Source: Industry, B&K Research

Charging infrastructure

For EV penetration, the eco system – Specifically the charging infrastructure is the key constraint globally and most of the developed economies are creating large scale charging infrastructure.

Global Charging Points Estimate by 2020



Rank	Country	Charging Points	%Δ wrt 2015
1	China	5.4 million	698%
2	USA	3.5 million	345%
3	Netherlands	0.93 million	273%
4	Germany	0.92 million	600%
5	France	0.86 million	438%

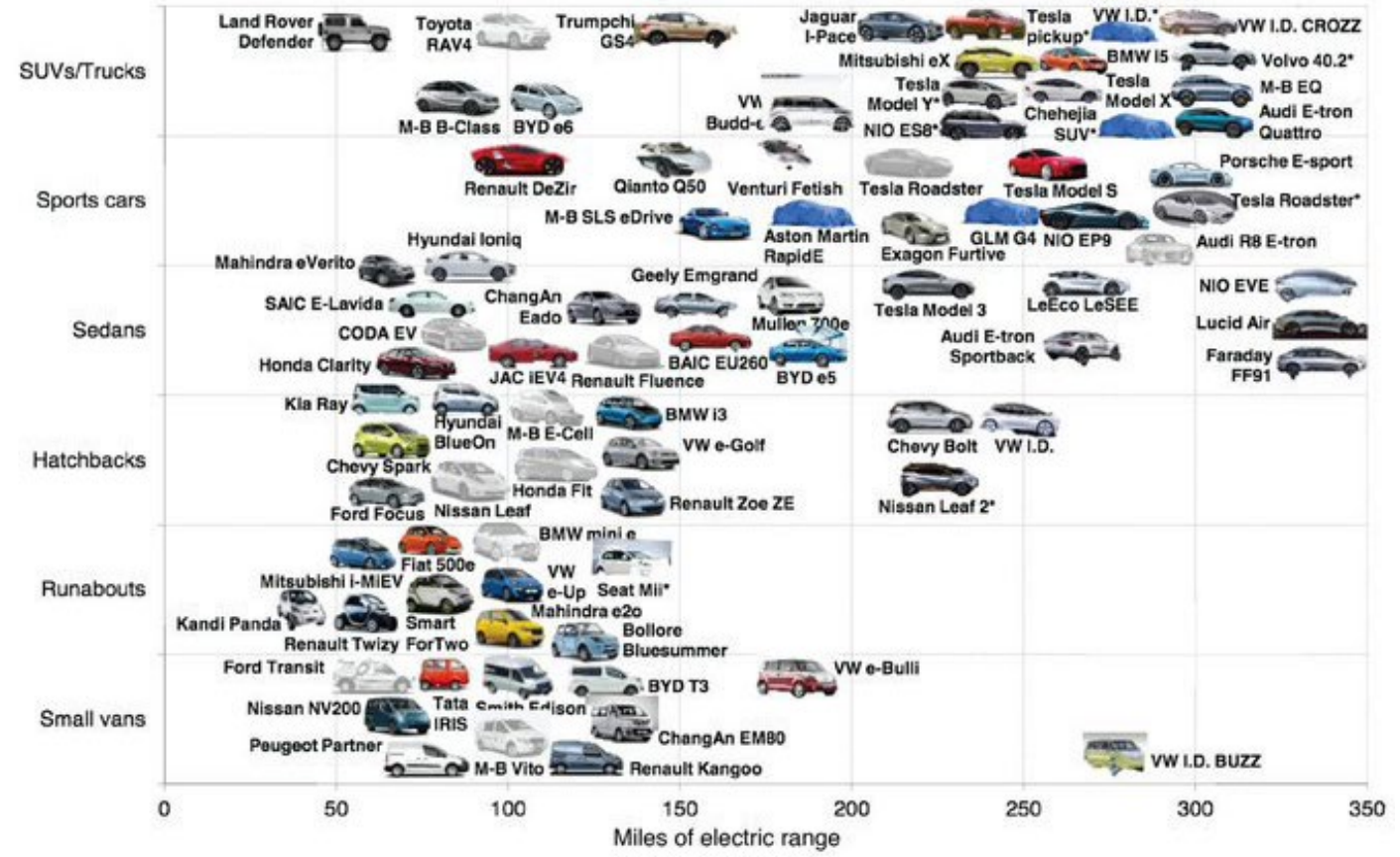
Source: Industry, B&K Research

EV plan by global players

Considering the global shift towards EV, the global major OEMs are now working on EVs with multiple platforms.

From current 100+ EV models now, it is estimated that ~200 EV models will be available globally by 2020.

Electric – Car Boom: Models by style and range available through 2020



Source: Industry, B&K Research

The EV plan by global auto majors:

Focussed EV action by global auto majors

- **VW Group** will roll out 80 electric cars by 2025 across group brands which include Skoda, SEAT and Audi. VW group is aiming for 2-3 mn EV sales by 2025. All its models are expected to have Electric Versions by 2030.
- **Renault** – Nissan is one of the leaders in deployment of modern electric cars due to top selling Nissan Leaf introduced in 2010 and Renault's Zoe Sub compact launched in 2012. The group is targeting 12 new pure – Electric models on road by 2022.
- **General Motors,** manufacturer of Electric Chevrolet Bolt, plans to launch a new family of Electric Vehicle by 2021. GM aims to sell 1 mn electric vehicles a year by 2026, many of them in China.
- **Ford** plans to invest US$ 5 bn in Electric Vehicles by 2022 and introduce at least 13 Electric/Hybrid models worldwide in the next five years including a small SUV offering an estimated range of 300 miles in one charge.
- **Daimler** is investing Euro 10 bn in Electric and Hybrid technology and is preparing to launch the EQ electric car. It aims for 100K annual electric car sales by 2020. By

2022, Daimler plans to offer an electric version of every model it sells, with a total of at least 50 Electric or Hybrid models for sale.

- **BMW,** a pioneer in electric cars launched i3 in 2013. The company plans to launch 12 full electric models by 2025, with a range of up to 700 KMs.
- **Volvo Cars** has announced that all Volvo car models launched after 2019 will be Electric or Hybrids.
- **Toyota** wants all its vehicles to be zero emission by 2050. Toyota is investing heavily on technologies such as solid state battery which has the potential to cut the cost of making electric cars and is expected to be commercialised in first half of 2020's. Toyota has established a new venture to develop Electric Vehicle in partnership with Mazda Motor. Toyota has also signed agreement with Suzuki Motor Corp for introduction of electric cars in India in 2020.

Indian EV market

Indian Automotive Market

The Indian automotive market is amongst the fastest growing automotive markets globally. The auto and auto ancillary industry is one of the major contributors of India's industrial GDP and contributes ~7.1% of overall GDP. Further, it currently employs 30 mn people directly and indirectly.

In the passenger vehicle segment, production base is expected to increase from ~3 mn currently to ~7 mn passenger vehicle by 2025, to become the third largest passenger car manufacturer globally.

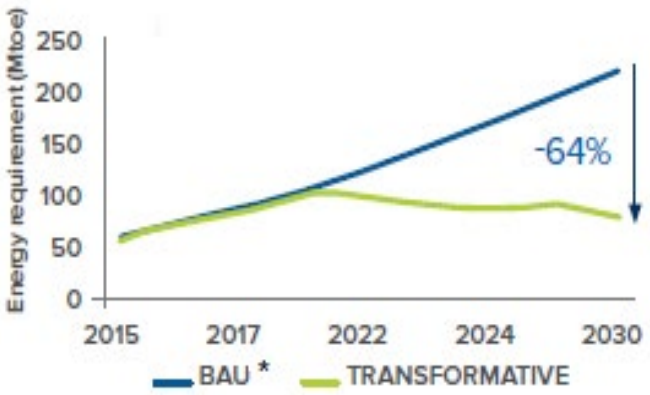
Ambitious Target –
- *Policy framework*
- *Charging infrastructure*
- *Domestic LiB battery manufacturing capacity*
- *Launch of India specific EVs are key factors*

On the energy front, India is the third largest oil importer globally and imports 81% of requirement. India spends ~US$ 80 bn annually on oil imports.

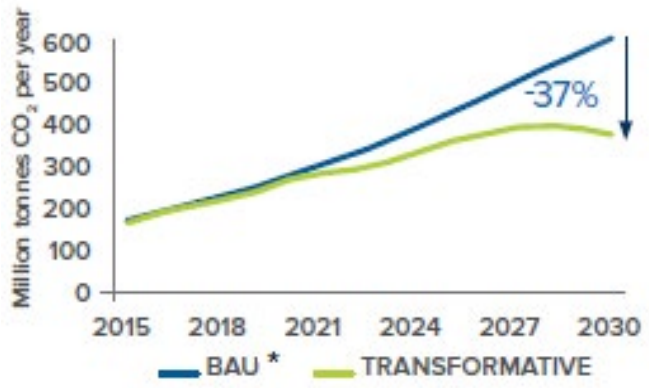
Considering energy security, emission (As per World Health Organization, 10 out of world's 20 most polluting cities are in India and also India had 1.2 mn causalities in 2016 due to pollution) and to reduce oil import dependence, India has announced ambitious 100% Electric Vehicles by 2030 (from current 0%).

The Government of India's think tank, NITI Aayog has published a document "India Leaps Ahead – Transformative Mobility Solution for All" in May 2017 and has estimated that India can save 64% of energy consumption and 37% of carbon emission in 2030 by pursuing a shared, electric and connected mobility future. This would result in reduction of 156 Mtoe in petrol and diesel consumption for 2030, implying a saving of US$ 60 bn (@ US$ 52/barrel).

Energy consumption from motorised passanger transport



Co_2 emissions from motorised



Source: NITI Aayog

* BAU - Business As Usual

The Electric Vehicle penetration is currently very low in India due to lack of charging infrastructure, high cost of EV, affordability and lack of EV models for the buyer.

NITI Aayog has published a 15-year time plan (2017-32) for a shared, connected and electrical mobility for India in three phases.

Plan by NITI Aayog

	PHASE 1 2017–2019 "NOTCHING THE ARROW"	PHASE 2 2020–2023 "DRAWING THE BOW"	PHASE 3 2024–2032 "LETTING THE ARROW FLY"
Overview and Objectives	• Capture opportunities that are already economic and capable of rapid scaling, while cultivating actions that are nearly economic.	• Improve and scale actions introduced in Phase 1. "Nearly economic" actions from Phase 1 become ready for deployment. • Simultaneously, public- and private-sector actions continue to enhance the economics and feasibility of future actions.	• All segments are market-ready for electrification and deployment is underway nationally. • Feedback and lessons from previous phases inform and enable comprehensive adoption and scaling of mobility solutions at the national level.
Key Actions	• Prioritize institutional capacity building and aggregating ITD, as they enable subsequent solutions. A series of structural reforms and policy interventions follow to support the adoption of mobility services, better urban planning, and open data sharing. • Manufacturers and consumers receive appropriate incentives to seed market confidence.	• As markets grow, infrastructure and production capabilities develop in tandem, paving the way for more innovative business models and policies. • System-wide mobility solutions are deployed in multiple states.	• Immaterial incentives are phasing out as costs are coming down. • Indian industry is meeting a majority of domestic demand and beginning to serve global markets. • Regulatory and policy mechanisms are fully mature and enabling competitive markets.

Source: NITI Aayog

The first phase (2017-19) will be near-term actions to build policy frame work, build market confidence and capture economically feasible opportunities. The second phase (2020-24) will be for development of charging infrastructure, supply chain and short listing policy frame work and incentives. The third phase (2025-32) will be for phasing out subsidies, refining policies and incentives and scaling for international demand.

India will be announcing the comprehensive electric vehicle policy in December 2017.

Incentives and Initiatives in India for EVs

To promote EVs, India has FAME (Faster Adoption and Manufacturing of Hybrid & Electric Scheme) incentive and also concessional GST rates.

FAME

Despite FAME and GST concession, EV sales in India is low due to lack of charging infrastructure and lack of choices

FAME scheme was launched on 01 April 2015 under the National Electric Mobility Mission Plan 2020 (NEMMP).

In NEMMP, the government is facilitating and supporting the charging infrastructure and development of indigenous battery technology which is fast charging, high capacity and high range per charge run, in addition to incentive through FAME.

In the union budget 2017-18, Rs 1.75 bn has been allotted for promotion of green vehicles in the fiscal.

Incentive per vehicle under FAME scheme

EV incentives/vehicle	
	(Rs '000s)
Two-wheeler	2-30
Three-wheeler	3-61
Four-wheeler	13-138
LCV	17-187
Bus	3,400-6,600

Source: Industry

Concessional GST rates

To promote EVs, Electric Vehicles is being charged at 12% GST, as against 29% to 53% for ICE passenger vehicles. Government is also considering 0% GST for Electric Vehicles for three years.

Passenger vehicles – Post GST rates

		Base	Cess	Net
Small cars	Petrol	28.00%	1.00%	29.00%
	Diesel	28.00%	3.00%	31.00%
Mid-size cars		28.00%	15.00%	43.00%
Luxury cars		28.00%	**25.00%**	**53.00%**
SUVs		28.00%	15.00%	43.00%
Hybrids		28.00%	15.00%	43.00%
Electric		12%	0.00%	12%

Source : Industry, B&K Research

Purchase of 10,000 Electric Vehicles by EESL

A baby step in right direction by Government of India

Through, Energy Efficiency Services Limited (EESL), Government propose to buy 10,000 Electric Vehicles to replace part of existing Petrol/Diesel vehicles used in Government offices, over the next three-four years.

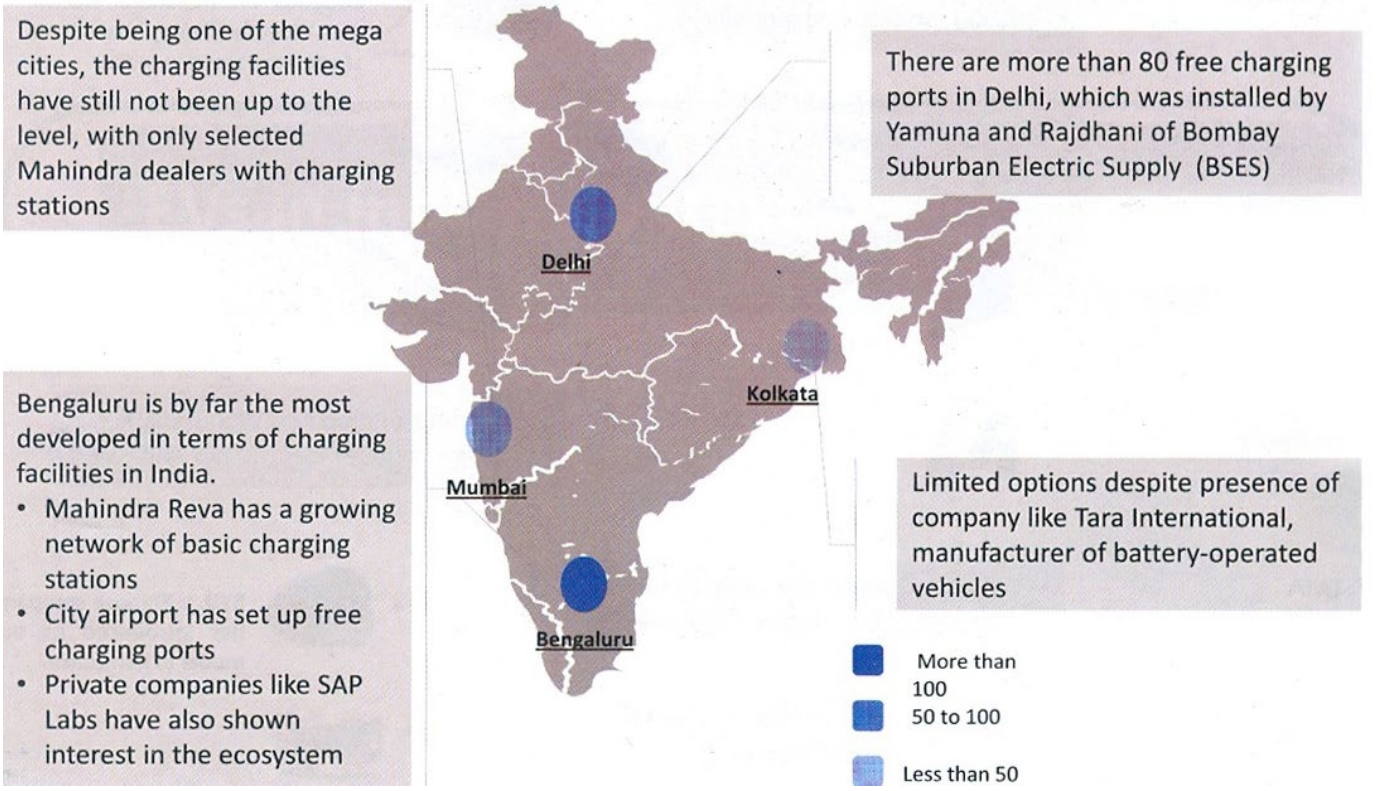
In first phase, Tata Motors will be supplying 350 vehicles and Mahindra & Mahindra 150 vehicles, by November/December 2017.

EESL also propose to float tender for another 10,000 vehicles by March-April 2018.

Charging infrastructure in India

Lack of charging infrastructure is one of the key hurdles for EVs India. Currently, India has only ~500 charging stations, as against 150,000 charging points in China in 2016.

Charging infrastructure across India



Source: Industry, B&K Research

Charging infrastructure can be a meaningful divesification for many power generation, oil manufacturing and auto companies

As per estimates, India may require 5 mn public charging stations by 2030.

In our view, the charging infrastructure has to be created upfront to drive EV adoption, rather than catching up with EV sales later. Already interest on charging infrastructure is shown by state owned energy companies (NTPC , Power Grid , Indian Oil), automobile OEM's (Maruti, M&M), private companies (Tata Power) and oil marketing companies.

NITI Aayog has also suggested swapping of batteries, to improve the EV eco system.

Potential EV path in India: 3W → 2W → Intra city Buses → Taxis → Private use car

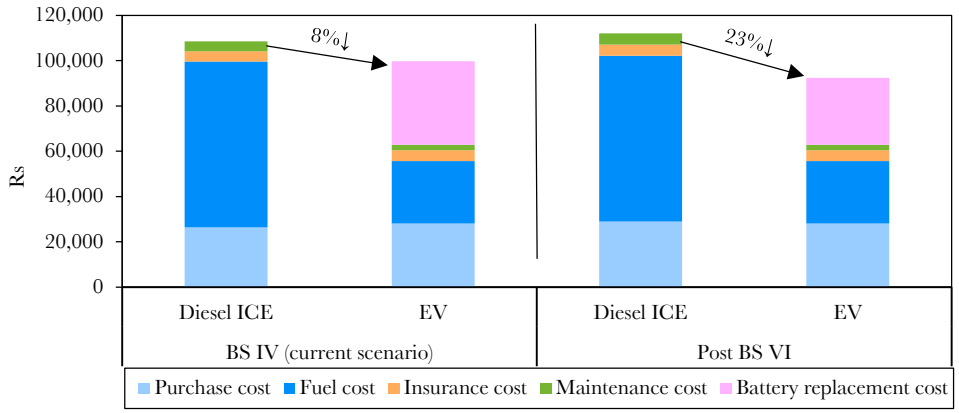
Considering total cost of ownership (TCO), market readiness, commercial operation feasibility, battery range and (Likely) improvement in charging infrastructure, we believe the EV path in India will be three-wheeler → two-wheeler → Intra city buses → Taxis → Private use car.

Three-wheelers

Due to commercial feasibility, the three-wheeler segment is already witnessing influx of e-rickshaws and as per estimates the current e-rickshaw population in India is around 1 mn.

Due to operational cost saving, the total cost of ownership (TCO) of Electric three-wheeler for commercial application is already 8% advantageous to ICE three-wheeler. After the implementation of BS VI emission norms in 2020, ICE vehicle cost is expected to increase by 8% to 15% and then EV three-wheeler is expected to be more advantageous by 23%.

Average annual cost of ownership for commercial three-wheeler



Source: B&K Research

TCO already in favour of electric three-wheeler

However, most of e-rickshaw is currently manufactured by unauthorised players with use of Lead acid batteries (which needs to be replaced within 7~8 months) and the vehicles are not reliable.

Policy framework and improvement in charging infrastructure can drive nationwide adoption

Due to unorganised nature of the segment, high interest rates is charged by the unorganised lenders. Also, there is rampant power theft for charging.

As the sector is cost sensitive, LiB battery is commercially unviable and warrants a much higher scale for adoption.

Given the head start of e-rickshaw segment, we believe a mild push by the Government will drive a nationwide adoption and we expect meaningful penetration by 2019 on improvement in charging infrastructure and necessary policy frame work in place.

Considering the potential in electric three-wheeler, established OEM's are working on e-rickshaws.

- **Mahindra & Mahindra** has already launched e-Alfa Mini electric rickshaw for passenger transport with Lead acid batteries and is working on e-rickshaws with LiB battery.
- **Bajaj Auto** has announced that the company will be launching electric three-wheeler in 2018.
- **TVS Motor** show cased its electric three-wheeler concept in Auto Expo 2016.
- **Kinetic Green Energy and Power Solutions Limited** has launched electric three-wheeler in April 2017, with LiB battery.

Two-wheeler

Two-wheeler industry is close to market readiness and is approaching break-even in EVs. After implementation of BS VI in 2020, TCO of electric two-wheeler will be advantageous by 13% than Petrol ICE.

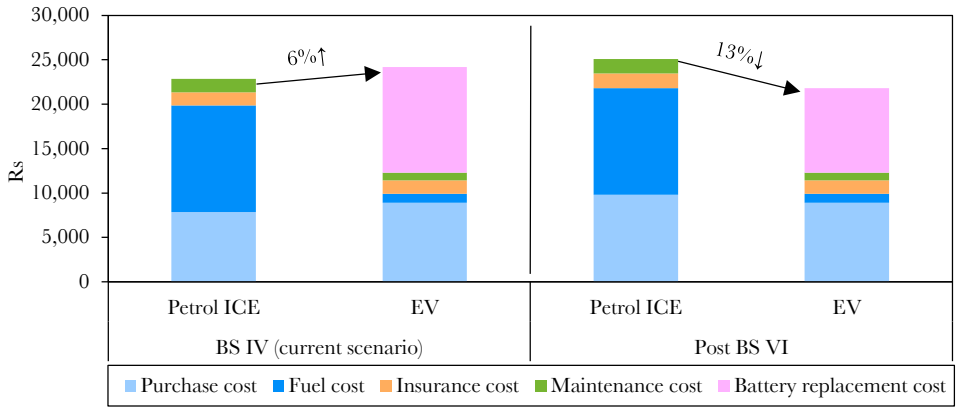
We expect two-wheeler shift to be mainly driven by limited operational use for daily commuting and ease of charging.

An end-to-end eco system (from in-house manufacturing to setting up charging infrastructure) being created by start-ups is likely to accelerate the adoption of electric two-wheelers.

With Government push on charging infrastructure development, we believe EV adoption in two-wheeler (that are mainly used of daily commuting 30-40 kms/day) can gain pace from 2020.

The electric two-wheeler development globally is on Scooters and our understanding is that there is design challenges in accommodating electric motor, battery and control systems in commuter motorcycle frame.

Average annual cost of private ownership for two-wheeler



Source: B&K Research

We expect meaningful penetration of electric two-wheeler in urban from 2020

Major OEM's and start-ups working on electric two-wheeler space.

- **TVS Motor:** Will be launching Hybrid two-wheeler in December 2017 and Electric two-wheeler in March 2018. Battery and battery management system will be assembled in-house.
- **Bajaj Auto:** Working on EVs. Launch of electric two-wheeler by 2020. May enter scooter segment through eScooters.
- **Hero MotoCorp:** Has 30% stake in Ather Electric (A Electric two-wheeler start-up). Working on own electric two-wheeler design and launch expected in 2020.
- **Ather Electric:** A Electric two-wheeler start-up and will be launching S340 eScooter in 2018. Establishing a manufacturing plant in Bengaluru.
- **Honda:** Working on a global electric two-wheeler and will be launched in 2018.
- **Hero Electric:** Already manufactures electric two-wheeler with lead acid batteries. Despite lower prices (compared to ICE), very low sales volume due to poor performance. The company is now working with Bosch for LiB battery technology and platform.
- **Electrotherm:** Manufactures electric two-wheeler from 2006 with lead acid batteries with brand Yo bikes. Very low volume due to poor performance.
- **Ampere Electric, Coimbatore:** A Electric two-wheeler start-up already manufactures Electric two-wheeler with lead acid batteries. Mr Ratan Tata and Mr Kris Gopalakrishnan have invested in this start-up.
- **Tork Motorcycles, Pune:** It has launched its first electric bike T6X (equivalent to a 200CC motorcycle) at a price of Rs 125,000.

MHCV – Intra city buses could go electric

Due to high vehicle utilisation, the potential to switch to EVs remain high in MHCV – Goods carrier. However, considering higher battery capacity requirements due to high

payload, daily long distance travel and lack of battery charging infrastructure, we believe MHCV – Goods carrier will continue to remain IC in the near future. Though, Tesla has displayed EV truck (Tesla semi) recently, we believe EV penetration in MHCV – Goods carrier will take significantly longer time.

In the CV segment, we believe SCVs and LCVs could be early adopters due to lower pay load capacity and lesser average daily run.

Despite high cost difference, we believe intra-city bus segment is more market ready for electric because of shorter trip lengths, route predictability and ease of fast charging at bus depots.

In addition, most of the intra-city buses is operated by state owned enterprises with investment capabilities and/or with state government financial support.

As diesel buses are one of the main city pollutants, we are already witnessing few e-bus pilots by state owned enterprises – Navi Mumbai, Himachal Pradesh, with a few more in the pipeline – Chandigarh, Telangana and Gurgaon.

Major players and plans for electric buses:

- **Ashok Leyland** has developed Electric Bus "Circuit" and is now test driven in Chennai. Has strategic alliance with Sun Mobility to develop Electric Mobility solutions. 100% owned subsidiary Optare already manufactures electric buses in UK.
- **Tata Motors** is running electric buses in Chandigarh and Guwahati.
- **Volvo Bus** manufactures electric vehicles globally and yet to announce the strategy for India.
- **BYD Group China** has formed a JV with Goldstone Infratech Limited to manufacture Electric Buses. The company will supply 6 buses to Mumbai and 25 buses to Himachal Pradesh.
- **JBM Auto** has tied up with Solaris, Poland to design and develop electric and hybrid buses for India.
- **Zhuhai Yinlong of China,** which also manufactures LiB batteries in China, has plans to set-up an Electric Vehicle manufacturing plant (for manufacture of buses & cars) in Punjab.

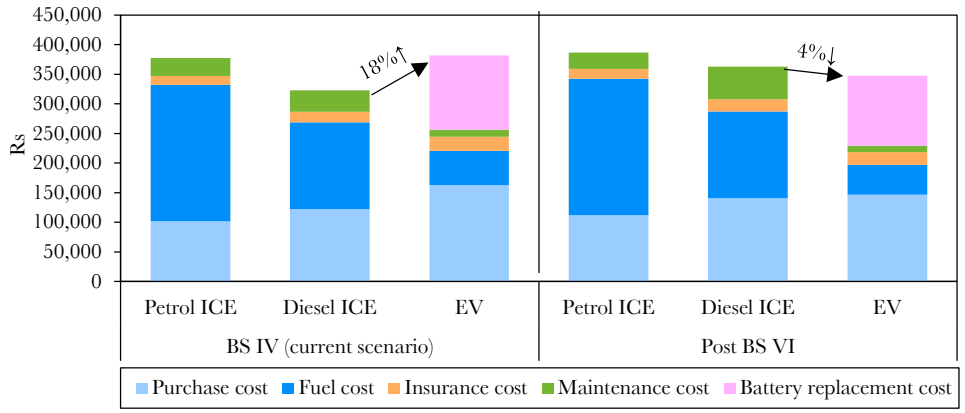
Passenger vehicles

In the passenger vehicle segment, the cost dynamics of running an EV for taxis, with high vehicle utilisation, is quite favourable by 2020 when BS VI gets implemented. Already M&M and Tata Motors have tied up with Ola & Uber on experimental basis in Nagpur and Delhi.

However, for a private user, the TCO for an EV remains much higher.

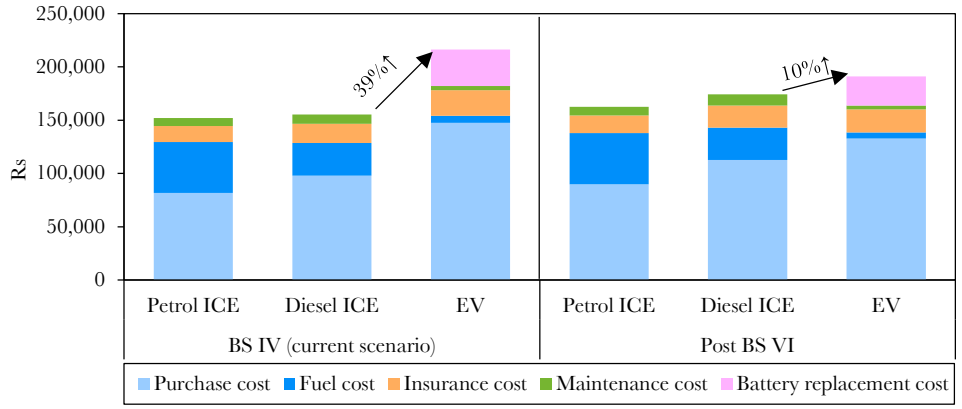
We expect meaningful shift in private use passenger vehicles from ICE to EV by 2025 when TCO of EV catches up with ICE on decrease in battery prices, scale for EVs, supported by widespread network of charging stations and launch of India specific EVs.

Average annual cost of commercial ownership of PV



Source: B&K Research

Average annual cost of private ownership of PV



Source: B&K Research

In the meantime, by increasing the excise duty and withdrawing incentives for hybrid vehicles in the last Union Budget, Government has expressed its preference for EVs over hybrids. However, considering lack of charging infrastructure, stricter emission norms from 2020 and fuel efficiency norms (CAFÉ), many major OEM's believe that hybrid may be the path to achieve total EVs later.

Major OEM's working on Electric PV/Hybrid space

- Suzuki Motor Corporation (SMC), Japan, parent of **Maruti Suzuki** is establishing a LiB battery plant in Gujarat in Joint venture with Toshiba (40% stake) and Denso (10% stake) and production is expected to commence from 2020. SMC has signed a MOU with Toyota, Japan and Toyota will provide technical support to Suzuki to produce Electric Vehicles in India, around 2020. SMC is also planning to build and export Electric/Hybrid vehicles from Gujarat plant.
- **Mahindra & Mahindra's** EV arm, Mahindra Electric currently manufactures and sells two electric cars – e20plus and eVerito. The company is working on advanced EV technology for longer range and better performance EVs. The company is also planning for expanding the current production capacity from 5K/annum to 60K/annum in Bengaluru. With support from overseas subsidiaries – Ssangyong and Pininfarina, M&M is working on high end EVs. M&M has received order for 150 EVs from EESL and has delivered 20 vehicles. Also, M&M is now running 100 EVs as taxis in association with Ola in Nagpur.

Challenging time for auto majors to work for EVs alongwith BSVI implementation in 2020

- **Tata Motors** is working on various electric cars (Tiago, Tigor and also Nano as per media reports) in collaboration with Tata Motors European Technical Centre (TMETC). Tata Motors has received order for ~10,000 EVs from EESL and 350 vehicles to be delivered before December 2017.
- **Renault Nissan** has popular global EV brand "Leaf" and "Zoe" and is working on Kwid EV for China launch in 2019. Yet to announce EV plan for India.
- **Ford** has entered into strategic alliance with M&M for exploring various avenues including EVs.
- Other multinationals like **Hyundai, General Motors, Volkswagen, BMW, Audi** are working globally on EVs and are yet to announce EV plan for India.
- **JSW Energy** is diversifying in to electric car manufacturing with capex of Rs 35 ~ 40 bn and aims to roll out first vehicle by 2020.

Auto OEMs under our coverage

Considering the global developments in EV space and the Indian Government drive towards EV, the Indian auto majors are now focussing on EVs, not to lose out on emerging opportunities.

But, at the same time, considering the uncertainty on timing of shift to EVs, the companies are not slowing down the development activities in ICE vehicles.

From now on, before any major investment decisions, we expect the investment proposal to go through the EV filter.

EV status of auto OEMs under our coverage

1	Ashok Leyland	AL has developed Electric bus "Circuit" and is now test driven in Chennai. The UK subsidiary Optare already manufactures Electric Buses. AL has strategic alliance with Sun Mobility (led by Mr Chetan Maini of Reva Car) for Electric Mobility solutions.
2	Bajaj Auto	Bajaj Auto has announced launch of Electric three-wheeler in 2018 and Electric two-wheeler in 2020. The challenge for Bajaj Auto will be to maintain its high domestic market share (59%) and profitability (EBITDA margin of ~30%) in electric three-wheeler. In two-wheeler, EV may provide opportunity for Bajaj to enter scooter market. Also, subsidiary KTM has technology for high end electric two-wheeler motor bikes (KTM Freeride E).
3	Hero MotoCorp	Hero MotoCorp has 30% stake in Ather Energy, a start-up in Bengaluru working on eScooter (S340) and the vehicle is expected to be launched by Ather Energy in 2018. Hero MotoCorp is working on its own electric two-wheeler and is expected to launch the vehicle in 2020. The challenge for Hero MotoCorp will be to design an electric motorcycle for mass commuter market and defend high market share. However, the rural is expected to be ICE dominant for some more time due to charging infrastructure and power constraints.
4	TVS Motor	TVS Motor will be launching hybrid two-wheeler in December 2017 and electric two-wheeler by March 2018. TVS Motor is ahead of its peers in EV development and is likely to have an early entrant advantage. TVS Motor will be importing battery cells and will be assembling the battery in-house. TVS has also developed its own battery management system and motor design.
5	Maruti Suzuki	Though Maruti believes hybrid will be the route in the medium-term to achieve EV finally in India, the company is now working on India Specific EVs, considering government focus on EVs. Parent Suzuki Motor Corporation (SMC) is establishing a Lithium ion battery plant in Gujarat in Joint Venture with Denso and Toshiba, with an investment of Rs 11 bn and is expected to be in operation by 2020. The cell module will be supplied by Toshiba and Denso will share the technology platform. Maruti/Suzuki has plans to export Hybrid/ Electric vehicle from Gujarat. SMC has signed a MoU with Toyota, Japan and Toyota will provide technical support to Suzuki to produce Electric Vehicles in India by 2020.
6	Mahindra & Mahindra	M&M is the only company which has been selling Lithium ion electric cars for the last many years (e20 plus and eVerito) and the company has sold 2K vehicles in 2016. Despite Government incentives, the sales has not been encouraging due to lack of infrastructure and lower range per charge (80 to 110 kms). M&M is already working on Electric three-wheeler, two-wheeler and LCVs. Has already launched Electric three-wheeler e-Alfa in India and two-wheeler GenZe in the US market. With Government thrust on Electric Vehicle, M&M can improve market share in auto segment. In the tractor segment, we believe tractor will be ICE dominant due to infrastructure constraints and power situation in rural areas.
7	Eicher Motors	We expect leisure biking to be ICE dominant in the near future.
8	Tata Motors	Tata Motors is working on Electric Buses and Electric Cars in collaboration with Tata Motors European Technical center (based in University of Warwick in UK). Tata Motors has received order from EESL recently for supply of 10,000 eVehicles, with first phase supply of 250 vehicles in December 2017. JLR will be launching their first EV I-PACE in 2018 and also working on more platforms. However, globally, peers are planning many aggressive launches.

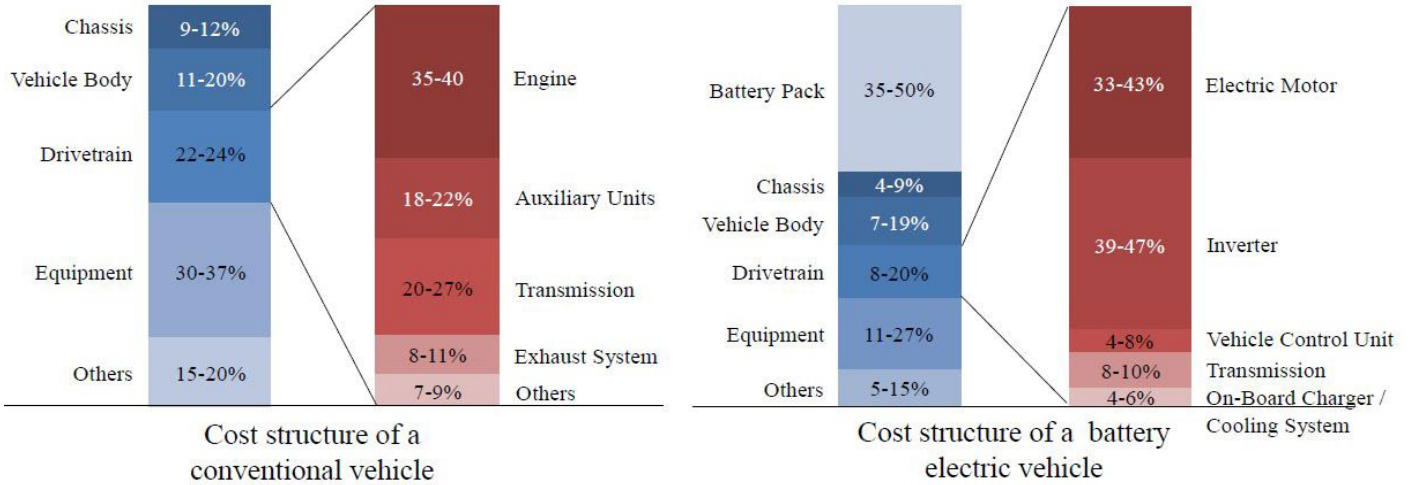
Impact of EV on auto component companies

The transformation from ICE vehicle to EVs is expected to have significant impact on the auto component industry.

An EV is relatively simpler to build with only 20 moving parts against ~2,000 in an ICE vehicle.

The engine, transmission and exhaust system of a conventional ICE vehicle will be replaced by battery, electric motor, simpler transmission system, inverter and control systems in an electric vehicle, with estimated cost structure comparison as below:

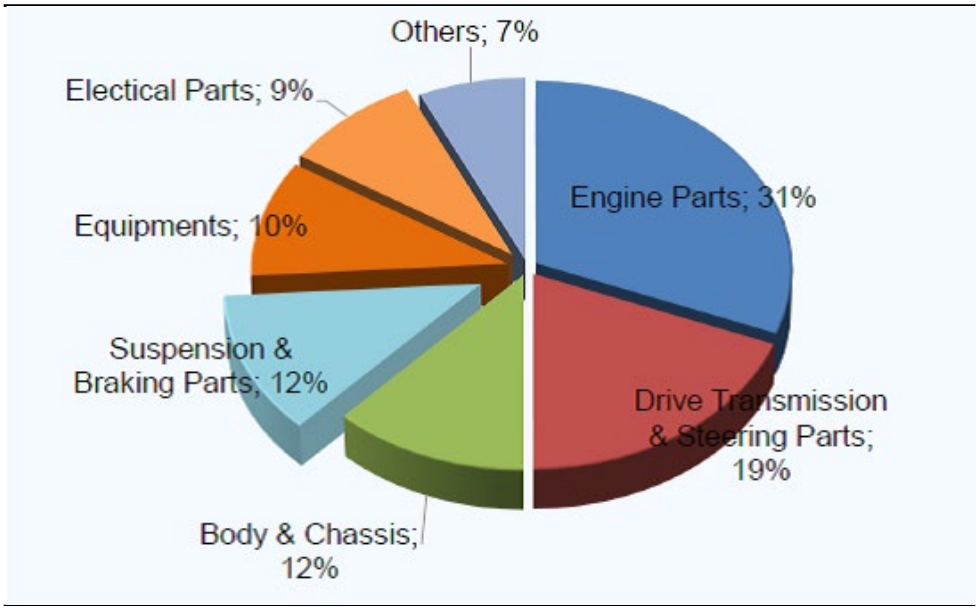
Cost structure comparison – ICE versus EV



Source: B&K Research

The current revenue break-up for auto component industry in India is:

Auto Components Industry – Revenue Breakup



Source: Automotive component manufacturers Association (ACMA)

Engine Parts and Drive Transmission parts to have impact on EV

The impact on EVs will be significant for auto ancillary companies manufacturing engine parts (Cylinder block, Cylinder Head, Crankshaft, Camshaft, Connecting rod, Air intake, Exhaust systems, Fuel injection system, Cooling system), Drive and Transmission parts (Clutch, Gear Box, Differential) and part of electrical parts (Generator, Starter motor). There may not be significant impact on Body and Chassis parts, Suspension parts, Equipment (A/C, Wiper, Heater, Infotainment) and others like Tyres, Mirrors, Glass, Interiors.

Impact on major auto components

Negative impact	Neutral	Positive impact
Engine parts	Steering systems	Electric motors
Clutch	Seats	LiB batteries
Radiators	Headlights	Wiring harness
Gears	Leaf springs	Inverter
Generator	Shock absorbers	Controllers
Lubricants	Tyres	Microprocessor
	Wheel	

Existing power train related suppliers would lose markets, making them significantly smaller in an EV scenario. Whereas new opportunities lies in EV parts such as LiB battery, motors, controllers and microprocessors.

The existing suppliers will not only have to deal with the transition but also face competition from the new entrants in the industry such as technology companies and battery companies.

As EVs gain traction in India, a number of foreign collaborations, partnerships and consortiums between OEM's, auto component suppliers and battery manufacturers is expected.

We analysed the impact of EV on the major listed auto ancillary companies on the following criteria and grouped into three categories: high impact, medium impact and low/positive impact:

- The impact analysis is based on current the product portfolio of the auto component companies. Going forward, the companies can diversify to EV components/products and has not been considered in our impact analysis.
- In India, we expect EV transition in three-wheeler and two-wheeler, followed by taxis in passenger vehicle segment and then private use cars.
- In the commercial vehicle segment, intra-city bus segment is expected to move towards EV (due to environmental concerns). We expect goods carrying MHCV trucks (~85% of domestic MHCV volume) to remain ICE due to high pay load capacity, battery range cover and lack of charging infrastructure in highways.
- Tractors to remain ICE due to charging infrastructure constraints and power situation in rural.
- Considering the uncertainty in EV transition time frame and also as most of the companies are yet to announce concrete plan for EVs, we have not worked out the financial impact for the companies.

High impact

1	Amara Raja Batteries	AMRJ currently manufactures only lead acid batteries and ~66% of revenue is from automotive. R&D under progress for LiB battery technology. Has access to Lithium ion technology from JV partner Johnson Control. No significant impact expected in the near-term due to EV. Though electric cars and buses have auxiliary lead acid batteries, the prime power source will be LiB batteries. With major OEM's like Maruti (Suzuki), TVS and M&M establishing own LiB battery manufacturing/assembly facilities, the current duo play in lead acid battery market (AMRJ and Exide) will be under threat in the long-term.
2	Exide	As like AMRJ, Exide currently manufactures only lead acid batteries and ~60% is automotive. Has tied up with Chawai Group, China for two-wheeler LiB batteries. Long-term threat due to EV, as like AMRJ.
3	Federal Mogul	Market leader in Piston, Piston rings and also a major player in Valve seats and Valve guides, all associated with IC engines.
4	SamKRG Piston	Manufactures Piston and Piston rings primarily for two-wheeler segment and 100% associated with ICE.
5	India Nippon Electricals	Manufactures auto electrical products (CDI, regulator) for two-wheeler/three-wheeler segment and the products may not be required for electric two-wheeler/three-wheeler.
6	Shivam Autotech Limited	Key supplier of transmission components to Hero MotoCorp and transition to EV in two-wheeler segment to impact the company as transmission system is much simple in EV and hence less content per vehicle.
7	The Hi Tech Gears	Transmission component supply to domestic two-wheeler (~50% of revenue) to have impact due to less content per vehicle.
8	Talbros Automotive Components	Core standalone business and subsidiary Nippon Leakless Corporation to have impact due to EVs. Two-wheeler and three-wheeler segment contribute 37% of domestic sales and PV 28% and will have impact.
9	Ucal Fuel Systems	Manufactures carburetors for two-wheeler/three-wheeler and will not be required for electric two-wheeler/three-wheeler.
10	Precision Camshafts	Manufactures camshafts, which are used in IC engines. ~70% export to USA and Europe passenger car market. EV transition and global PV market to impact Precision Camshafts.
11	Castrol	40-45% revenue on supply of lubricants to personal mobility segment (two-wheeler and PV). Long-term threat, as lubricants (engine oil) are not required for EVs.
12	Igarashi Motors	Predominantly an export player. Currently supplies DC Motors for Electronic Throttle control and is also working on supply of DC Motors for Exhaust Gas Recirculation (EGR) and Turbochargers for the global market. All the three motors are associated with IC engines and may not be required for EV. Can diversify to comfort motors in cars like Power Windows, Seats, Mirrors. However, this segment is already crowded.
13	L.G. Balakrishnan & Bros	Two-wheeler chain business (~60% of revenue) – expected to be impacted by electric scooters.

Medium impact

1	Bosch	The key product of Bosch India Limited – Fuel injection system is completely dependent on IC engines. However, CV, Tractor, after-market and non-auto contribute ~80% of revenue for Bosch and will not have impact on EVs in the near future. On electric two-wheeler, Bosch has significant presence in China and also Bosch Global is associated with global major OEMs for electric PVs. Considering expertise of Bosch Global in EV space, we believe EV will open up significant opportunities for Bosch in India. Bosch is already working with OEMs on electric two-wheeler and three-wheeler in India and the company has announced that Bosch will serve EV space in India through the listed company.
2	Rane Holding	Rane Madras, Rane TRW and Rane NSK may not have impact due to EV. Valve train components (Engine valves) will have impact due to EV (~15% of consolidated revenue).
3	Rico Auto Industries	Supply of Engine & Transmission components to two-wheeler and PV to be impacted by EV (Our estimate: 40-45% of revenue). Management has indicated that the company is working on aluminium castings for global EVs.
4	Sundaram Clayton	Castings to two-wheeler (TVS Motor) and passenger vehicle (Primarily Hyundai) to have impact on EVs (~50% of revenue). We believe supplies to CV players – Cummins, Volvo, Daimler and WABCO may not have impact in the near future.
5	Bharat Forge	Non-auto and supply to CV segment not expected to be impacted by EVs. Supply to PVs (~15% of revenue) to be impacted by EVs in near future. Management has indicated that the company is already in discussion with global OEMs for the supply of forged and machined components for EVs.
6	Bearing companies: SKF, FAG, Timken	Supply to non-auto will not have impact on EVs (~50% of revenue for the bearing industry). In the auto segment, supply to two-wheeler and PV engine related bearings to be impacted (Our estimate: ~10% of revenue). However, the bearings used in EV will be of high precision and will offset to some extent.
7	Sundram Fasteners	Supply of Engine and Transmission components in both domestic and export markets will have impact due to EVs (Our estimate: ~20% of revenue). However, the company is already working on EV components. Sundram Fasteners has received order from Tesla for supply of Bevel Gear and surge tank cap.
8	Endurance Technologies	Suspension and Braking components may not have impact due to EV. However, part of aluminium casting (Cylinder block, Cylinder head) and Transmission components will have impact due to EVs.
9	Mahindra CIE	Castings, Composites and Stampings – No impact due to EVs. Crankshafts and Gears to PV to have impact (~10% of consolidated revenue).
10	Minda Industries	Switches, Horns, Alloy wheels – No impact due to EVs. CNG/LPG kits, batteries, air filter, canister to have impact due to EVs. However, the revenue contribution is currently not significant.
11	Minda Corporation	Locks, Wiring harness, Plastic components – No impact due to EVs. auto electricals and part of few aluminium castings will have impact due to EVs. But revenue contribution currently not significant.
12	Lumax Auto Technologies	Lighting, Chassis and Frames, Molded parts and after-market – No impact. Gear shifters, intake system and Oxygen sensor (12-15% of consolidated revenue) will have impact.
13	Tube Investment	Cycles, Engineering and Door Frames – No impact. Two-wheeler chains (~10% of revenue) will have impact.
14	Banco products	MHCV segment dependent – May have limited impact due to Electric Buses.
15	MM Forgings	Supplies to domestic and overseas PV segment (~10% of revenue) will have impact.
16	Pricol	Driver information system and Telematics will not have impact due to EVs. Sensors, Pumps and the new JV for oxygen sensor will have impact due to EVs (Our estimate: ~25% of revenue).

Low/Positive impact due to EVs

1	Automotive Axles	MHCV segment dependent – No significant impact due to EVs in near future.
2	Suprajit Engineering	Neutral to power train. Phoenix Lamps also neutral to power train.
3	Bharat Seats	Neutral to power train.
4	Lighting companies: Lumax Industries, FIEM Industries	Neutral to power train.
5	Shock absorber companies: Gabriel, Munjal Showa	Neutral to power train.
6	GNA Axles	CV and Tractor dependent – No significant impact expected due to EVs in the near future.
7	Jamna Auto Industries	Neutral to power train
8	Jay Bharat Maruti/JBM Auto	Power train – Neutral. JBM Auto has entered into JV with Solaris, Poland for Electric Buses.
9	Motherson Sumi Systems	Polymer, rear view mirror and wiring harness business – Neutral to power train. Light weighting and increase in wiring harness in EVs will be structurally positive for Motherson. It's overseas subsidiaries (SMR & SMP) are already supplying EV parts to Tesla, Renault Nissan, BMW & General Motors.
10	Sona Koyo Steering Systems	Neutral to power train.
11	Subros	Neutral to power train.
12	Tyre companies: MRF, CEAT, Apollo, JK Tyre	Neutral to power train.
13	WABCO India	CV dependent – No significant impact expected due to EVs.
14	Wheels India/Steel Strips and Wheels	Neutral to power train.
15	Nelcast	MHCV and Tractor dependent – No impact expected due to EVs in the near future.
16	Asahi India Glass	Neutral to power train.
17	ZF Steering Gear	Supplies Steering System for MHCV and Tractors – No impact due to EVs in near future.
18	Setco Automotive	Clutches for CVs – No impact expected due to EVs in near future.
19	PPAP Automotive	Neutral to power train.

Implication for other sectors

EVs could cause impact in employment opportunities in ICE vehicles related auto ancillary companies. Also, due to lower maintenance requirements of EVs, it could affect after-sales network and unorganised mechanics.

In addition to automotive, EVs can have direct & indirect impact in many other sectors.

EV impact on various sectors

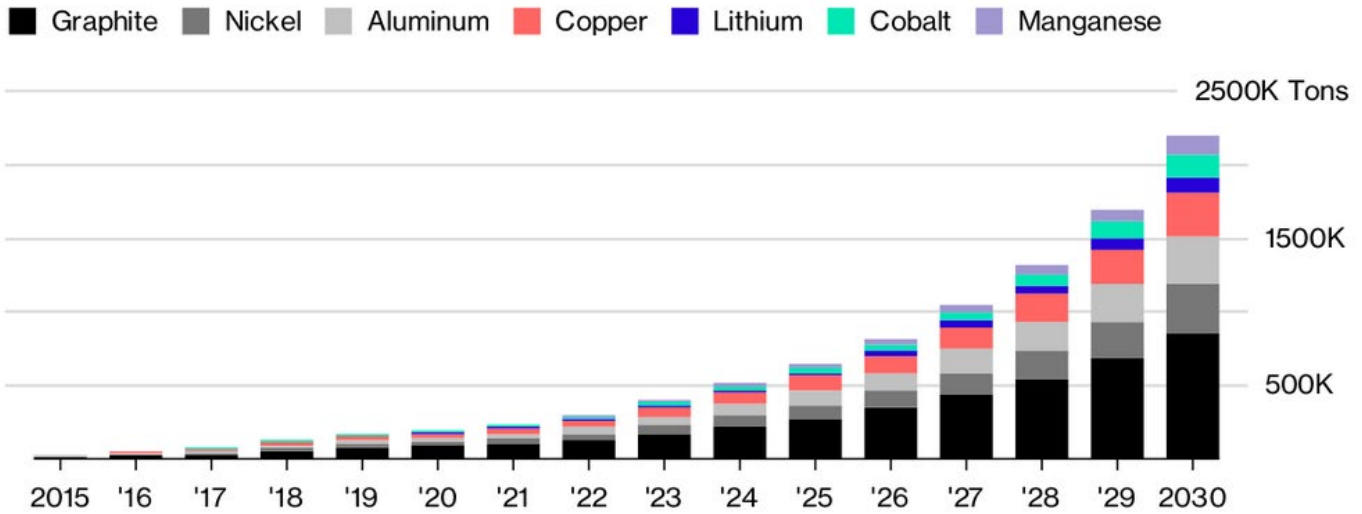
Negative impact	Positive impact
Oil & Gas companies	LiB battery manufacturers
ICE component suppliers	Electric Motor & Component manufacturers
After-sales network	Power Generation companies/Grids
Unorganised mechanics	Mining Companies (Li, Co, Gr, Ni, Cu, Mn)
Mining companies - Fe, Pb, Pt	Companies and start-ups establishing battery charging and swapping set ups.

Impact of EV on Metals

Transition to EV will have positive impact on metals like Graphite as graphite is the material used for anode in LiB batteries. For Cathode, different formulations are used with Nickel, Cobalt and Manganese. The Electrolyte in LiB batteries is Lithium. Including motors, it is also estimated that electric cars contain about 3 times more copper than a regular IC vehicle.

On the other side, due to light weighting in EVs, demand for aluminium is expected to go up and with corresponding drop in steel. Requirement for lead is expected to drop, due to drop in lead acid battery requirements. Platinum used in catalytic converter is expected to drop.

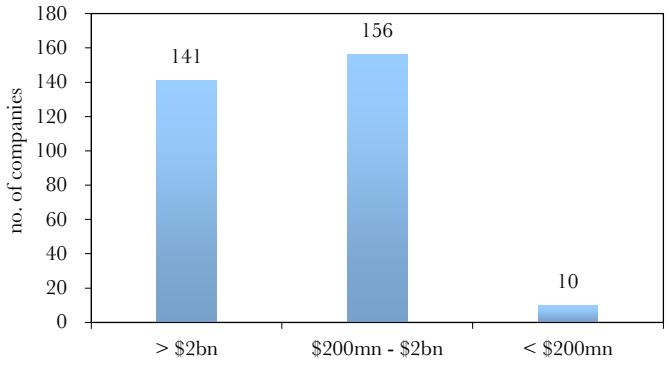
Demand surge: Global metals and materials demand due to EV



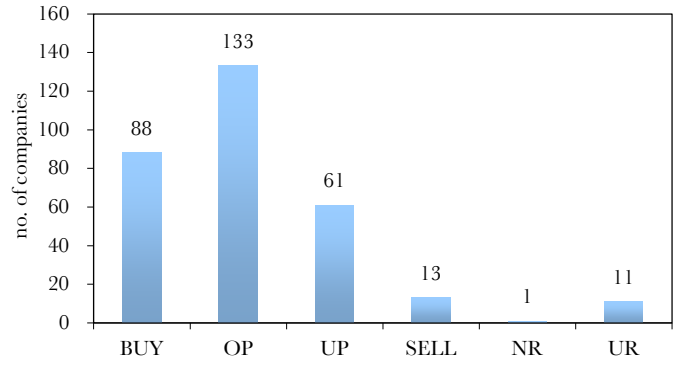
Source: Bloomberg New Energy Finance

B&K Universe Profile

By Market Cap (US$ mn)



By Recommendation



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UNDERPERFORMER	+10% to -10%	+15% to -15%	+20% to -20%
SELL	<-10% (absolute returns)	<-15% (absolute returns)	<-20% (absolute returns)

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