Electric Vehicle Conference

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Decoding Electric Vehicle Disruption

We organized our first 'Electric Vehicle' conference, featuring eminent speakers representing the entire EV value chain – Global & Indian OEMs, Government associations, Battery manufacturers, Component suppliers, Sustainable mobility players and Charging infrastructure companies. We witnessed full-house participation with over 700 investor meetings over a period of two days. Across the value chain, the expectation of EV adoption is high, and now the debate has shifted from "when" to "how fast". Recent moves of firms across the value-chain on the product line-up and investment fronts, as well as their resolve to go 'all electric' have notably reset the expectations regarding the pace of EV adoption. The key takeaways given below highlight initial signs of improving EV adoption:

OEMs: New products expected to drive adoption: Global OEMs already have a wide range of products, which are being introduced either directly (e.g., Mercedes Benz) or through collaborations (e.g., GreenPower). In addition, almost all domestic OEMs and startups (e.g, Ather) are also indigenously developing and launching products. These launches should drive the evolution of consumer profile from 'early adopters' and 'technophile purchasers' to 'mass adopters' over the medium- to longer term. Apart from the shift in customer preference from ICE to EV for private use, there is a shift expected in the commercial and shared mobility space (e.g., Yulu) due to superior cost economics. EV penetration should be sooner in 2Ws and 3Ws, while adoption may be gradual in PVs. **We expect an increase in competition and margin pressures for incumbents in 2Ws and 3Ws over the next 2-3 years.**

Government policies are in the right direction: EV penetration is expected to be driven by stringent emission norms, incentive schemes, well-defined long-term policies, standardization of charging infrastructure and a structured approach to reduce dependency on imports. FAME-2, PLI and state government EV policies are expected to promote EV demand, improve localization, increase cost competitiveness and develop a complete ecosystem.

Battery manufacturing capacities are expected over the medium term as Li-ion battery cost stands at 40-50% of raw material cost and localization is necessary to achieve cost competitiveness. The government's PLI scheme for Advanced Chemistry Cells with incentives of Rs181bn should encourage investments. As EV demand improves over the medium term, capacities would be commissioned, through investments from OEMs, international ancillaries (e.g., Octillion), domestic ancillaries and startups (e.g., Lohum), either on their own or through consortiums. Due to economies of scale and technological advancements, battery costs are expected to decrease to below USD100/KWH over the medium term. Battery swapping technology can support EV adoption and could be successful for 2Ws and 3Ws. Lead acid batteries are being used for SLI (Starting, Lighting and Ignition) functions in electric vehicles. In the near term, these batteries may continue to be used, but over the medium to long term, lead acid batteries may be replaced by Li-ion batteries. **This will pose a structural risk for companies such as Exide Industries and Amara Raja Batteries.**

Component suppliers are gradually adapting to EV transition through indigenous product development or global tie-ups (e.g., Minda Corp, Napino and Tata AutoComp) as components need to be localized under a phased manufacturing program. FAME-2 incentives are being provided to OEMs, only if required localization levels are achieved. The PLI scheme for components with incentives of Rs570bn should encourage further investments. Based on global experience, only a few existing ancillaries and startups that focus on EV components are likely are to benefit, while others lose out. **This will pose a structural risk for companies dependent on ICE engine/ transmission components.**

Charging infrastructure is being expanded notably by existing power companies (e.g., Tata Power) and startups (e.g., Volttic and Sunergize) in highways, tourist locations, hotels, offices, malls, parking areas, dealerships, residential societies, etc. Similar to global experience, it is expected that over 70% of the charging needs would be met by home charging.

Our positive view on the Automobile sector is underpinned by expectations of a strong cyclical upturn, which is expected to last at least three years. Our top picks among OEMs are TTMT (TP: Rs410), AL (TP: Rs155), MSIL (TP: Rs8,500) and EIM (TP: Rs3,300). Domestic CV, PV and Premium 2W companies are not expected to be impacted by EV transition over next 2 years.

Please see our sector model portfolio (Emkay Alpha Portfolio): Automobiles & Auto Ancillaries (page 12)

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Mercedes Benz India: Represented by Mr. Martin Schwenk, MD & CEO

Key takeaways:

- Global experience is encouraging. Norway targets to achieve 100% ZEV (Zero emission vehicle) sales by 2025. Several other European countries have set aggressive targets for 2030. Governments across the world have spent USD14bn (+25% yoy) in CY20 on direct subsidies and tax deductions for xEVs.
- Battery Electric Vehicles (BEVs) have grown even more rapidly as compared to Plug-in Hybrids (PHEVs) globally in CY20. The share of BEVs is expected to further increase ahead. In India, there is not much focus on PHEVs due to low demand.
- Key barriers for EV adoption include lack of charging infrastructure, safety concerns, less than desired driving range, TCO gap between ICE vs. EV and long charging times. The tipping points for EV adoption, as per a global study, include price parity with ICEs, reduction of charging times to ~30 minutes and increase in driving range to ~470km. Price parity with ICEs is expected to be achieved in the second half of this decade.
- Mercedes Global has a target to achieve >50% xEV share by 2030 and be Carbon Neutral by 2039. In Q1CY21, xEV share was 10% of sales.
- It has BEVs such as EQC, EQA and EQB. Further launches of EQS and EQT are expected this year. EQS will have >750km driving range and 15 minutes charging will provide 250km range.
- It plans to have >5BEVs and >20PHEVs by 2021, >10BEVs and >25PHEVs by 2025, >20BEVs and <25PHEVs by 2030.
- Mercedes India has a total of 25 models (24 ICEs). Of this, 12 models are locally assembled and sold through approximately 100 dealers across 47 cities. India investments stands at around Rs26bn.
- EV penetration is expected to be driven by stringent emission norms and incentive schemes. India government intentions on emissions reduction and EV adoption are strong – steps such as skipping of BS V emission norms, implementation of CAFÉ/RDE norms in 2022/23, favorable GST rates/subsidies for EVs, etc are encouraging.
- **In India, EQC 400 model was launched in 2020. 24% of the customers are 40 years or younger and 60% use vehicle for city driving. It offers 8 years of battery warranty.**
- The company's focus on developing software capabilities and strengths such as strong brand/network will enable to face increasing competition.

Bajaj Auto: Represented by Mr. Soumen Ray, CFO

Key takeaways:

- BS VI CNG 3Ws are eco-friendly. Electric 3W adoption is at a nascent stage. Electric vehicles are less preferred in comparison to CNG vehicles, as initial purchase cost is higher, running costs are similar on non-gradient roads, and there is range/charging anxiety. Cost is more important factor than pride of ownership.
- **Bajaj Auto will enter Electric 3W segment in FY22. It plans to provide a better overall package to fleet owners in comparison to CNG option.**
- It will be prepared to address the EV opportunity in both 3Ws and 2Ws, but will not rush toward EV conversion.
- Electric vehicle industry may be skewed toward charging option in comparison to swapping option. Bajaj Auto's electric scooter currently has charging option, but the company is agnostic about swapping option as of now. Gogoro of Taiwan has been successful in implementing the swapping option.
- **KTM has electric 2Ws, and Bajaj can leverage this partnership and launch products in India based on demand/market conditions. Once the strategic decision is taken, product development and commercialization can happen in less than a year.**
- Import content is below 50% in Electric 2Ws. It plans to collaborate in the near term, and eventually increase localization as volumes increase. Battery management system (BMS) needs to be proprietary as it provides competitive edge.

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- Battery costs in India are much higher than global rates due to lower scale. Over the next 6-12 months, price gap could narrow with EV adoption across segments.
- Service life of battery stands at >5 years for personal vehicles and <5 years for commercial vehicles.
- **EV demand is expected to improve due: 1) Shift in customer preferences from ICE to Electric, 2) Usage of Electric vehicles for commercial purposes due to better economics, and 3) Last mile micro mobility segment (Example: Yulu).**
- Capex for assembly line of 1mn electric 2Ws could be in the range of $100-120mn.
- Lithium ion battery disposal will eventually be taken up by OEMs. As of now, there is no established mechanism.

Panel discussion on Electrification of 2Ws

We hosted Mr. Naveen Munjal, MD of Hero Electric and Mr. Tarun Mehta, Co-founder & CEO of Ather Energy.

Background of companies:

- **Hero Electric** is a pioneer and market leader in the Indian Electric 2W industry. The company comes under the umbrella of Hero EcoTech, the business conglomerate headed by Mr. Vijay Munjal.
- **Ather Energy** is among Top-4 players in Indian Electric 2W industry. Ather is also setting up Ather Grid, a network of fast charging points in the country. The company has raised total funding of USD140mn from investors such as Hero MotoCorp, Sachin Bansal and Tiger Global. Hero MotoCorp holds a 35% stake in the company.

Key takeaways:

- **EV demand is expected to improve due to shift in customer preferences from ICE to Electric and usage of EVs for commercial purposes.** For commercial purposes, slow E-scooters with top speed of 25 km are being adopted, as these delivery personnel are shifting from bicycles and entry-level ICE motorcycles, due to better cost economics.
- Customer awareness about EVs is improving. A part of customers are shifting to EVs due to environmental benefits, but more importantly a shift to EVs is being perceived by customers as an upgrade - a model that provides higher aspirational value or pride of ownership. Ather Energy is focusing on improving desirability for the product through features such as large screens, navigation/phone connectivity options, reverse assist, remote monitoring through application, etc.
- **E-2Ws have the potential to reach 20% of the total market in 2025. Penetration is expected to be higher at 30-35% for the B2B segment due to favorable cost economics.**
- Based on global experience, EV adoption is expected to be more pronounced in Scooters and gradual in motorcycles. Within E-2Ws, 80% is expected to be Scooters and remaining 20% would be motorcycles over the medium term. The gradual penetration in motorcycles is due to higher rural usage and requirement of high-speed vehicles.
- E-scooters are classified into three categories: 1) Slow speed with top speed of 25 kms, 2) City speed with speed to 45-50 kms, and 3) High speed with top speed of 70-80 kms. Slow speed is being adopted for commercial usage, while city speed and high speed are being adopted for personal use.
- Battery swapping option could succeed in B2B segment, as vehicle usage in higher. There could be challenges to acceptance of swapping option such as: 1) Need for dense swapping infrastructure, 2) Not owning the battery can be detrimental to Indian customer sentiment, and 3) Declining battery costs may result in lower profitability for swapping providers.
- Penetration will be supported by entry of new players, launch of more models and network expansion. Given the small size of the industry, Hero Electric and Ather Energy are not worried about entry of new OEMs such as Ola Electric.
- Ather Energy has expanded to 12 cities as of Mar'21 and it is planning to go to 30-40 cities by Mar'22.

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- It is expected that most of the charging requirements would be met from home charging, and requirements of publicly accessible chargers is low.
- Suppliers are adapting to EV transition and several components are being localized. Government incentives under FAME-2 and PLI schemes are also expected to provide a boost to localization.
- Dealers and mechanics are also being trained to adapt to EV transition. Hero Electric has already trained 6,000 mechanics and is targeting to reach 20,000 mechanics in subsequent years.

Green Power Motor: Represented by Mr. Fraser Atkinson, CEO & Chairman and Mr. Brendan Riley, President & Director

Key takeaways:

- Green Power Motor is a NASDAQ-listed (~USD500mn market cap) electric CV manufacturer with headquarters in Vancouver, Canada, and manufacturing operations in California, USA. GreenPower serves local cargo & delivery market, transit, shuttle and school sectors.
- GreenPower's flagship product is EV star platform, and vehicles based on this platform have 95% commonized parts. Incentives are high at up to 80% of purchase price, as this product is certified under Altoona and compliant under Buy America Act.
- In FY20, GreenPower delivered 68 buses, including 62 EV Stars, 4 battery electric school buses, and 2 EV 350s, generating $13.5 million of revenue, with gross profit of $4 million or 30% of sales.
- EV adoption is expected to increase, notably in the US. For Electric Medium and Heavy Duty trucks, it is expected to grow from 1,600 in CY20 to over 50,000 units in CY25, 227,000 units in CY30 and 912,000 units in CY40. For Electric buses, it is expected to grow from 2,037 units in CY20 to over 25,000 units in CY30 and 76,000 units in CY40. These estimates are as per Bloomberg NEF.
- Current production capacity is of 30 EV stars per month which is expected to increase to 50 EV stars per month in the near term.
- EV model prices are 20-50% higher than ICE models without subsidies. However, including incentives, the gap reduces notably, especially in California where EV prices are similar or lower than ICE models. Payback period for EV star products is about 2 years, led by lower running and maintenance costs. Maintenance costs are dramatically lower, and EVs are being offered with maintenance free traction for up to 1mn km.
- The company doesn't see carbon neutral E-fuels as a threat because of EV's cost effectiveness, convenience and easy/universal availability of electricity.
- **EV star, EV star CC and EV star cargo are being considered for introduction in Indian market post detailed study of demand conditions, price expectations and government incentives. The company is looking for partnerships with domestic OEMs, and would set up fabrication and assembly facilities. The objective is to introduce products that can offer total cost of ownership parity with ICE vehicles.**

Panel discussion on Government support for EV penetration

We hosted Mr. Randheer Singh, Director of Niti Aayog and Mr. Anand Deshpande, Senior Deputy Director and Head of Automotive Electronics Department of ARAI.

Background:

- **NITI Aayog** is a public policy think tank of the Government, established with the aim to achieve sustainable development goals with cooperative federalism by fostering the involvement of State Governments in the economic policy-making process using a bottom-up approach.
- **Automotive Research Association of India (ARAI)** is the automotive R&D organization, set up by the Automotive Industry in association with the Government of India. ARAI is an autonomous body affiliated to the Ministry of Heavy Industries and Public Enterprises, Government of India. ARAI is one of the prime Testing and Certification agencies in India.

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Key takeaways:

- Till March 2021, only 55,000 E-2Ws/ 3Ws and 2,700 E-buses have benefitted from the FAME-2 scheme. Only a negligible portion of FAME-2 target has been achieved due to unavailability of high-quality models, large price difference between ICEs and EVs, and Covid impact. Buses' adoption has been better due to purchases by state transport undertakings, though still below target. Government is considering remodeling of FAME-2 scheme to improve acceptance.
- Through phased manufacturing program, government has supported localization of important 21 components such as Compressor, Power Electronics, Charging, Battery pack, Traction Motor, Chassis, etc., as incentives under FAME-2 are provided, only if required localization is achieved.
- Niti Aayog is also working with states to come out with their own EV policy with focus on areas such as demand, supply, manufacturing, R&D and charging infrastructure. Select cities could be made entirely electric to develop a model for EV Industry.
- Advance Chemistry Cell (ACC) PLI scheme is important, as battery localization and cost-competiveness is important for development of EV Industry. Complete details of the scheme is expected to be notified shortly. As per Bloomberg NEF estimates, India can be the lowest cost country for manufacturing cells (NMC 622 pouch cells) at $92/ KWH in optimistic scenario and subsidies could reduce it further to $65/KWH.
- **For ACC, companies will be selected through a competitive bidding process for setting up minimum 5 GWH plant. This plant has to be commissioned within two years at an investment of Rs2.25bn per GWH with 25% domestic value addition, which has to increase to 60% in five years. The minimum initial investment works out to Rs11.25bn. After plant is commissioned in two years, the incentive will be disbursed over a period of five years. The incentive rate is awaited. The incentive amount will increase with improved specific energy density, cycles and local value addition. Many companies are expected to participate either on their own or though consortiums.**
- Government has currently focused on end-product (batteries), but is expected to work on incentives for raw material suppliers as well. The objective is to develop the complete eco-system.
- Niti Aayog has recommended financiers to provide EV specific loans targeting first-time buyers and collateral-free loans.
- Government is working on charging and swapping standards and a notification is expected in future. It is also focused on safety of batteries and rigorous tests are being undertaken at ARAI electric mobility centers.

Yulu: Represented by Mr. Amit Gupta, Co-founder and CEO

Key takeaways:

- Company background: Yulu is a technology-driven mobility platform that enables Integrated Urban Mobility. This is provided through electric Micro Mobility Vehicles (MMVs) and a user-friendly mobile application.
- Personal mobility is expensive and there are gaps in public transportation, which provide opportunity for Mobility As A Service (MAAS). It is not a new concept and has been successfully implemented by various companies in global markets (Example: Velib in Paris, Bolt in US, etc.).
- MAAS is for people who do not have personal vehicles, which stands at ~80% of India's population. Opportunity size is 500mn daily rides. Shared mobility players such as Uber/Ola have only 1% share of the daily rides.
- Yulu's target is first mile (up to 5km) and last mile mobility (up to 3km) segments, which constitute 65% of daily rides. Yulu is targeting 100mn Indians who are using metros, buses, sub-urban railways, auto-rickshaws, e-rickshaws or walking.
- It has been catering to cities such as Bangalore, Mumbai, Navi Mumbai, Pune, Delhi, etc. It has an installed user base of 3.2mn. MMV has top speed of 25kms, asset life of ~42 months and is suited for a single passenger.

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- With fleet of 10,000 vehicles, number of trips have increased to ~900,000 and revenue has grown to Rs30mn in month of Mar'21. Number of trips since Feb'20 has increased by 2.6x, which implies that Covid has been a tailwind, resulting in increased acceptance of MAAS.
- Yulu has built an eco-system: 1) Has partnered with Bajaj Auto for purpose-built vehicles, 2) Has partnered with local government authorities who are supporting MAAS, 3) Has developed dedicated parking/charging network and 4) Has developed technological platforms to support operations.
- At the current stage, Yulu owns 10,000 vehicles and is supporting operations through equity investments. In stage 2, it plans to increase to up to 100,000 vehicles, funded by debt and leases. In stage 3, assets will increase beyond 100,000 vehicles funded by leases. In stage 4, it will adopt a franchise model which will help much faster scaling up of business.
- Bajaj Auto has invested $9mn for a 16% stake in Yulu. Bajaj is helping Yulu for developing supply chain for third-generation MMV, would support repair & maintenance through own dealer network, support global expansion in export markets and support in lease financing of its assets through its NBFC group company.
- Financial targets: Expand fleet to 50,000 EVs by Dec'21, EBITDA positive by Oct'21 and cash positive by Dec'21. Its target is to reach Top 10 cities which have a population of 1bn people. It has a roadmap to build USD 100mn business in 2 years, by deeper penetration in target geographies.
- Over the long term, focus is on: 1) Setting up of Yulu service in 100+ Indian cities and 50+ Global ones, 2) Last mile delivery and long-distance use case, 3) Yulu commerce platform for sustainable mobility and living products, 4) Value creation using Data, and 5) Monetization of IoT hardware and charging station network.

Panasonic Energy Systems: Represented by Mr. Atul Arya, Head-Energy System Division

- Panasonic Energy India is one of India's largest manufacturers and suppliers of dry cell batteries and lighting products. Panasonic Global has strong presence in EV and storage batteries. It is working on advanced chemistries to improve energy density, usefulness and cost competitiveness.
- Setting up of new battery manufacturing capacities would depend on: 1) Demand, 2) Availability of raw materials, 3) Government policies and 4) Technology.
- **Government's PLI scheme for Advanced Chemistry Cells is a step in the right direction. However, EV demand will remain an important factor for setting up manufacturing capacities, and India EV market is still small. As EV demand improves over the medium term, battery manufacturing capacities would be commissioned, through investments from OEMs, international battery companies, domestic ancillaries and startups, either on their own or though consortiums.**
- Supply chain in India is still at a nascent stage. The entire eco-system needs to be developed. Currently, requirements of battery cells, components, BMS, etc. are being met through imports.
- EV penetration would be more pronounced in 2Ws, while adoption may be gradual in 4Ws. 2W space could see a quicker adoption as existing OEMs and startups are aggressively launching products. In comparison, major PV OEMs are still reluctant to launch EVs.
- Li-ion battery costs have been steadily reducing due to economies of scale and technological advancements in cell chemistries. However, battery costs may be volatile ahead due to increasing cost of raw materials. Going forward, electric vehicle cost reduction has to be achieved through cost reduction across components and not just in batteries.
- Nickel cobalt aluminium oxide (NCA), nickel manganese cobalt oxide (NMC) and lithium iron phosphate (LFP) cathodes for Li-ion batteries are the most widely used chemistries today. LFP batteries may have the largest share of Li-ion batteries used in xEVs due to preference in China. There are hardly any non-Chinese companies which manufacture LFP batteries. NMC has better energy densities, but LFP has lower cost, higher cycle life and better safety. LFP is heavier and consumes space, which may restrict adoption. Unlike NMC or NCA batteries, the recycling value of LFP batteries is relatively low because it does not contain high-value metals.

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- The company continues to focus on new chemistries, which generally need development period of at least 5-7 years. New chemistries represent an improvement from Li-ion on indicators such as cost, density, cycle life, and benefits from more widely available materials than Li-ion technologies.
- **Battery swapping technology** can catalyze the uptake of electric vehicles and is expected to be successful for 2Ws. Advantages of swapping include: 1) Reduction in acquisition cost of vehicle, 2) Reduction in running cost vs. ICEs, 3) Time savings as swapping takes less than three minutes, 4) Flexibility for vehicle owner to either charge or swap, 5) Improvement in battery life as swapped batteries can be charged via slow charging in a controlled environment to prolong the battery life, and 6) Lower distribution space and investments required for swapping stations as compared with a charging station. For instance: Gogoro has been successful in implementing battery swapping option along with Panasonic in Taiwan.

Panel discussion of Battery manufacturers

We hosted Mr. Rajat Verma, Founder & CEO of Lohum Cleantech, Mr. Vikram Handa, Managing Director, Epsilon Carbon and Mr. Yashodhan Gokhale, Vice President - Electric Batteries Division, Octillion.

Background of companies:

- **Octillion Power Systems** is a US-based supplier of energy storage systems catering to the US, China, Europe and Indian markets focused on the electrification of PVs, CVs, 2Ws, 3Ws and other storage solutions. The company has so far delivered more than 275,000 EV batteries. Octillion has a 50% market share in India electric bus market in 2020. It has a battery pack capacity of 4.2 GWH with more than 200 patents. In Pune, it has an R&D centre and assembly line of over 250 MWH capacity.
- **Epsilon Carbon** manufactures coal tar derivatives catering to industries such as aluminium, carbon black, tyres, mechanical rubber goods, graphite, specialty and construction chemicals, and dyes and pigments. For Li-ion batteries, Epsilon manufactures anode precursor materials at its 2500T capacity plant, along with pilot facilities for further processing to synthetic graphite. It has a MoU with Finland-based graphite miner to convert its natural graphite flakes to spherical purified graphite to be used as anode material. Synthetic graphite is more popular than natural graphite as carbon can be manipulated to suit requirements of Li-ion batteries. Epsilon is expanding capacities from 2,500T to 35,000T by 2025 and 100,000T by 2030.
- **Lohum Cleantech** focuses on 1) Li-ion battery manufacturing for low-power mobility & stationary applications, 2) Re-purposing used battery packs, modules and cells to create new batteries, and 3) Recycling used batteries to extract battery materials for reuse. Used batteries can be productive in the right application for at least another three years. The reclaimed materials are of higher quality than traditional mining and are ready to be used in the process to manufacture new batteries. The focus is on 1) Maximizing battery cell life through re-purposing, 2) Creating new battery raw material supply through recycling, 3) Reducing energy demand and CO2 emissions, and 4) Driving cost reduction.

Key takeaways:

- Li-ion battery cost is around 40-50% of the raw material cost of the vehicle. To achieve cost competitiveness, it is important to localize battery manufacturing and government should incentivize both raw material suppliers and battery manufacturers.
- **Government support is imperative for localization:** Government's PLI scheme is expected to encourage investments. This scheme should help in achieving manufacturing capacity of 50 GWH of Advanced Chemistry Cell (ACC) and 5 GWH of Niche ACC, considering the incentive outlay of Rs181bn. Firms will be selected through a competitive bidding process for setting up minimum 5 GWH plant. This plant has to be commissioned within two years at investment of Rs2.25bn per GWH with 25% domestic value addition, which has to increase to 60% in five years. Minimum initial investment works out to Rs11.25bn. After plant is commissioned in two years, the incentive will be disbursed over a period of five years. The incentive amount will increase with increased specific energy density, cycles and local value addition. Although the scheme is good, it missed out on incentives to create a raw material eco-system.

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- Due to economies of scale and technological advancements in cell chemistries and manufacturing costs, battery cost is expected to decrease to below USD100/KWH over the medium term. Technology evolution leading to cost reduction, better range and lower charging time will support matching of cost of ownership of ICEs and EVs over the medium term.
- Nickel cobalt aluminium oxide (NCA), nickel manganese cobalt oxide (NMC) and lithium iron phosphate (LFP) cathodes for Li-ion batteries are the most widely used chemistries today. LFP batteries may have the largest share of Li-ion batteries used in xEVs due to preference in China. NMC has better energy densities, but LFP has lower cost, better safety and higher cycle life.
- Li-ion batteries can use graphene to enhance cathode conductor performance. Graphene batteries are expected to improve performance and reduce the charging time for vehicles.
- Over the next decade, Li-ion batteries are likely to dominate the EV market. New technologies include the lithium-metal solid state battery, lithium-sulphur, sodium-ion or even lithium-air, which could represent an improvement from Li-ion on indicators such as cost, density, cycle life, and benefits from more widely available materials than Li-ion technologies. However, not a single technology reaps all these benefits at the same time. In addition, even once performance is proven in the lab, deployment and scaling up of these new technologies will take time and compete with the well-established Li-ion technology.
- Battery swapping technology can support EV adoption and could be successful for 2Ws and 3Ws. It can reduce acquisition cost of vehicle, save time as swapping takes less than 3 minutes, provide flexibility to owners to either charge or swap and improves battery life due to use of slow charging. However, there are challenges as standardization of battery packs is required for battery swapping and many OEMs protect the design and information about their battery pack as it is their core technology.
- Hydrogen used in fuel cells has an energy to weight ratio 10 times greater than Li-ion batteries. Consequently, it offers much greater range while being lighter and occupying smaller volumes. It can also be recharged in a few minutes, similar to ICEs. However, Hydrogen fuel cells also come with many drawbacks. First, hydrogen is mainly obtained from water through electrolysis which is basically a reversed fuel cell and takes electricity and water to produce Hydrogen and Oxygen. The source of this electricity can range from renewables to coal depending on the plant location. Other issues include storing hydrogen as a gas is expensive and energy-intensive, sometimes as much as half the energy. In addition, it is highly flammable.
- Lead acid batteries are being used for SLI (starting, lighting and ignition) functions in electric vehicles. In the near term, these batteries may continue to be used. However, over the medium- to long term, lead acid batteries may be replaced by Li-ion batteries.

Minda Corporation: Represented by Mr. Aakash Minda, ED, Finance & Strategy and Mr. D. Suresh, CTO

Key takeaways:

- The company has been focusing on EVs by having two separate divisions dedicated to EV in the form of EME division (Electronic Manufacturing Excellence) and Spark Minda Green Mobility Company.
- Offerings for Green mobility include Battery charger, Motor Controller, DC-to-DC Converter, BMS (under development), Vehicle Control Unit (under development) and Motor (under development).
- Expects content per vehicle to increase to up to Rs20,000 for 2W segment, out of which 60% is from new products dedicated for EVs. Most of its portfolio is EV agnostic. Currently, revenue from EV dedicated components is nominal.
- The company is more focused on power electronics. For BMS, Minda is in final talks for collaboration with major startups. BMS is ~20% of the battery cost.
- EV customers include Ampere, Ashok Leyland, Bajaj Auto, BGauss, Electra EV, Escorts, Etergo, Mahindra Electric, OLA Electric, Olectra, Polarity, TAFE, TVS Motors and Virya Mobility.

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- The company's EV strategy includes: 1) Setting up of an R&D unit, 2) Licensing of existing technologies from global suppliers for components and localization and 3) JVs with global suppliers.
- The potential for EV adoption is improving and government needs to support with incentives, well-defined long-term policies, standardized charging infrastructure and structured approach to reduce dependency on imports.
- Capex guidance for FY22 is Rs1.3bn. Of this, some portion is toward green mobility. The company is scouting for partnerships in the EV space.
- Considering potential demand, existing facility in Pune will be expanded with a dedicated assembly line for chargers, antennas and DC-to-DC convertors.
- Revenue growth is expected at 8-9%, higher than underlying industry, led by growth in Exports, premiumization and new products. Expects exports to see 20-25% CAGR over next 3-4 years and share of exports to increase to 15-20% of revenues.

Panel discussion of EV component manufacturers

We hosted Mr. Nilesh Dipani, Senior Manager - Business Development & EV Projects of Tata AutoComp Systems, Mr. Tripurari Kumar, Chief Financial Officer of Napino and Mr. Nakul Kukar, CEO and Co-Founder of Cell Propulsion.

Key takeaways:

Tata AutoComp

- The company is one of the leading component players in India with aggregate revenue of Rs60bn and 46 plants including 9 overseas facilities. It has 15 units and 4 major divisions – 1) Safety & Comfort, 2) Axle & Suspension, BIW, Electrical, 3) Powertrain, Cooling & Emission and 4) Aftermarket & Services.
- Products include drivetrain, battery pack, DC fast chargers, on-board chargers, DC-to-DC Converters, BMS, Telematics, Thermal management systems, etc. The company has developed products in modular form with the ability to scale up rapidly within 3-4 months.
- It has tie-ups with Gotion for battery packs, cell technology & BMS (3rd largest player in China for battery), Shanghai Edrive & Prestolite for Motors, Tellus Power for DC Fast charging, TRAD & Air International for thermal management systems and Ficosa for DC-to-DC Converter & electronics.
- The industry is still at a nascent stage and faces problems such as lack of testing facilities. There were difficulties faced initially due to lack of testing facilities for EV components such as battery packs. With the help of ARAI, Gotion engineers (JV partners) and in house engineers, they were able to conduct the tests in India.
- Tata Motors is expected to launch 3 new EV products over the next 2 years.
- Tata Chemicals is still scouting for a cell manufacturing partner for setting up battery manufacturing capacity.
- For batteries, the company has 65-70% of number of parts localized, including mechanical parts, copper parts, sheet metals, wiring harness, composite lids, body holders and plastic parts. Only the cells, BMS and connectors are imported. It will localize BMS hardware, but may continue taking software from Gotion. For motors, it is currently focusing only on assembly. For Chargers it has a sales agreement with Tata Power. For electronics, mechanical parts are localized and PCB hardware parts are sourced from JV partners. Expect PCB hardware to be localized by next year.
- The company is focusing on LFP technology due to cost, safety and cycle life which is suited for Indian conditions. It also has NMC technology in its portfolio.
- Payback period for EV components will be better in the initial years due to lower competition.

Napino

- Napino is a leader in ECUs in 2W segment in India. For the EV segment, the company is serving products such as Chargers, BMS, DC-DC Controller and Motors.

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- The company's focus is on Motors, which is important as vehicle mileage depends on it. By increasing torque or reducing motor weight, it can increase the range for E-2Ws. Another focus area is Motor Control Units.
- Expects technology evolution for components such as Motors and Batteries to continue in the medium term, before the industry consolidates. Use of permanent magnets in Motors and Li-ion batteries cannot be the solution for long term due to sustainability issues. Expects new forms of motors which do not have rare earth metals.
- Challenge remains on the parts which could be made by OEMs and which parts would be outsourced to Ancillaries.

Cell Propulsion

- The company was started in 2017 for core powertrain development for the CV segment. The focus is on high-voltage and high-power rating components, such as motors, battery, drives and BMS for the electric Bus and Trucks.
- It has developed integrated powertrains for deployment with fleet (Bus and Truck owners), along with the complete eco-system (aftersales, charging infrastructure, financing and insurance).
- After 2Ws and 3Ws, CVs can the next to witness EV adoption as the routes are fixed and range anxiety would be less. Expects traction in CVs to start from 2-3 years from now.

Panel discussion of Charging infrastructure companies

We hosted Mr. Sandeep Bangia, Business Head – EV charging ecosystem of Tata Power, Mr. Varun Chaturvedi, MD & CEO of Volttic and Ms. Shrikanti Nilange, Co-Founder & Director of Sunergize Energy Solutions. Key takeaways:

Tata Power

- The company has a network of 456 charging stations across 102 cities and 27 highways. Along with presence in AC/DC charging, it has setup 80 ultra-high capacity chargers for public transport buses.
- It is planning to expand public charging points to 2,500 in FY22 and to 100,000 over the medium term. The company has binding MOUs with Tata Motors, JLR and MG Motors for home charging network. It has installed over 3,000 home chargers and is a key beneficiary of expansion plans of these OEMs.
- It expects to expand charging infrastructure at highways, tourist locations, hotels, offices, malls/shopping centers, parking areas, dealerships, residential societies, etc.
- Highways are an important focus area as the main use of a public charging network is for inter-city travel. The company is in the process of identifying specific high-traffic density highway locations along the key city pairs like Mumbai-Ahmedabad, Delhi-Chandigarh, Delhi-Jaipur, Bangalore-Chennai, Hyderabad-Vijayawada and others to put up chargers.
- Similarly, it has identified tourist destinations like Mussoorie, Mahabaleshwar, Coorg, Dwarka and such locations where EV owners from a city would go for a driving excursion. It is putting up fast DC chargers at logical pit-stops along highways where vehicles can be charged.
- It has developed an application for locating the charging stations and making payments. It is also working on procuring batteries from OEMs for second life usage, which has application in power-grids.
- Similar to global experiences, it is expected that over 70% of charging requirements would be met from home charging. At home charging, cost would be same as home electricity rates or EV concession rates. At public charging station, fast charging price would be higher than slow charging.
- It has certainty of revenues from Buses and Fleet segments. Revenue from the personal vehicle segment would gradually ramp up as population increases.
- New generation cars in India from brands such as Tata Motors, MG Motors, Hyundai, Mercedes and JLR are coming with CCS standard. Old vehicles such as Tigor and Verito feature Type 2 chargers.

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- Requirement of number of charging station depends on the density of home chargers. In China, density is high (1 charging station for every 6 vehicles) and Norway (1 charging station for 20 vehicles). Norway is sparsely populated with many detached houses and private parking spaces, so most EV owners largely use private home charging.

Volttic Charging Solutions

- The company has network of 200 charging stations with focus within the city – offices, housing societies, malls/shopping centers, etc. Further 300 charging stations are expected to be added in the current year.
- Highway charging will be a focus area over the next 2-3 years. It expects to expand network to 25,000 commercial chargers by next 8-10 years. It is also working on a software platform to make charging stations accessible through applications.
- It expects public charging to be skewed toward fast chargers. For 100mn EV population, it would require at least 3mn publicly accessible charging stations. Charging for Buses require complex and dedicated hubs, Cars would depend more on fast charging and 2W/3W will be depend more on home charging or battery swapping.

Sunergize Energy Solutions

- The company is into consulting business for the EV industry for components manufacturing such as Li-Ion batteries and development of E-2Ws. It has a small network, and plans to expand to 1,000 charging stations by 2025.
- Investment required to set up a public charging station, which includes 5 types of chargers – Level 1 AC (3x3.3kW), Level 2 AC (22kW), Bharat DC – 001 (15kW), CHAdeMO (50kW) and CCS (50kW) – stands at Rs3mn. State governments such as Maharashtra are providing up to Rs1mn subsidy. Annual operational expenditure stands at around Rs1mn. Payback period for a charging station can be around 3-4 years, depending on utilization levels. Given the favorable cost economics and government subsidies, this provides a business opportunity for automotive dealers and other corporates.

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Emkay Alpha Portfolio – Automobiles & Auto Ancillaries

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Sector

Automobiles and Ancillaries

Analyst bio

Raghu holds an MBA and comes with total 11 years of research experience. His team currently covers 14 stocks in the Indian Automobiles and Ancillaries space.

EAP sector portfolio

Company Name	BSE200 Weight	EAP Weight	OW/UW (%)	OW/UW (bps)	EAP Weight (Normalised)
Auto & Auto Ancillaries	**5.26**	**5.26**	**0%**	**0**	**100.00**
Amara Raja Batteries	0.08	0.00	-100%	-8	0.00
Apollo Tyres	0.00	0.00	NA	0	0.00
Ashok Leyland	0.21	0.30	43%	9	5.65
Atul Auto	0.00	0.00	NA	0	0.00
Bajaj Auto	0.62	0.62	0%	0	11.82
Bharat Forge	0.19	0.19	0%	0	3.68
Eicher Motors	0.41	0.41	0%	0	7.86
Escorts	0.00	0.00	NA	0	0.00
Exide Industries	0.10	0.00	-100%	-10	0.00
Hero Motocorp	0.44	0.44	0%	0	8.29
Mahindra & Mahindra	0.90	0.90	0%	0	17.13
Maruti Suzuki India	1.05	1.05	0%	0	19.95
Motherson Sumi	0.34	0.33	0%	0	6.36
Tata Motors	0.68	0.73	7%	5	13.90
Tata Motors DVR*	0.08	0.14	64%	5	2.58
TVS Motor	0.15	0.15	0%	0	2.79
Cash	**0.00**	**0.00**	**NA**	**0**	**0.00**

Source: Emkay Research

High Conviction/Strong Over Weight High Conviction/Strong Under Weight

Sector portfolio NAV

	Base					Latest
	1-Apr-19	21-May-20	20-Nov-20	18-Feb-21	20-Apr-21	20-May-21
EAP - Auto & Auto Ancillaries	100.0	64.7	100.4	129.2	114.9	121.3
BSE200 Neutral Weighted Portfolio (ETF)	100.0	67.0	102.6	129.7	115.3	121.4

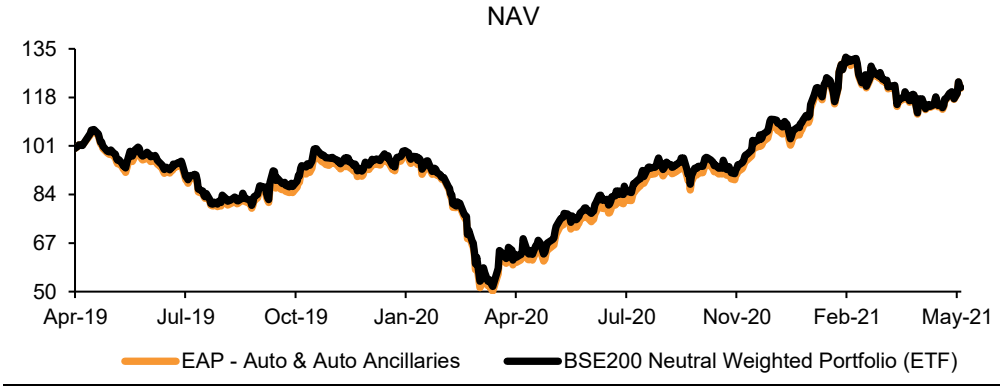
**Performance measurement base date 1st April 2019*
Source: Emkay Research

Price Performance (%)

	1m	3m	6m	12m
EAP - Auto & Auto Ancillaries	5.5%	-6.1%	20.8%	87.3%
BSE200 Neutral Weighted Portfolio (ETF)	5.3%	-6.4%	18.3%	81.2%

Source: Emkay Research

NAV chart



Source: Emkay Research

Please see our model portfolio (Emkay Alpha Portfolio): Nifty

Please see our model portfolio (Emkay Alpha Portfolio): SMID

"Emkay Alpha Portfolio – SMID and Nifty are a supporting document to the Emkay Alpha Portfolios Report and is updated on regular intervals"

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Ratings	Expected Return within the next 12-18 months.
BUY	Over 15%
HOLD	Between -5% to 15%
SELL	Below -5%

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