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INDIA'S EV ECOSYSTEM: CHARGING UP THE FUTURE



A RICHA TYAGI Telematics Wire

n India, the electric vehicle ecosystem is currently in its growing stage. The central government is making consistent and committed efforts and has already formulated dedicated EV policies and introduced various demand and supply incentives as part of efforts to encourage adoption of e-mobility in various market segments.

The growing popularity of electric vehicles is encouraging the leading automotive manufacturers to launch electric vehicles in India. For example, in October 2019, Maruti Suzuki announced plans to launch electric vehicles in the Indian market in the following years. In August 2021, Tata Motors also launched the Tata Tigor EV in the Indian market. MG-motors, Hyundai, BMW, Mercedes-Benz have also launched their range of electric vehicles in India.

According to ResearchAndMarkets reports, India's electric vehicle market size is expected to reach USD 152.21 billion by 2030. The market is expected to expand at a CAGR of 94.4% from 2021 to 2030. India is all set to become a major space in the global EV market as many EV startups have gone public and raised funds following the success of already established leading players in the market. Here we have covered some growing Indian Electric Vehicle companies:



Mahindra Treo Source: Mahindra Electric

Mahindra Electric

Mahindra Electric Mobility Limited is an Indian company based in Bangalore. It is formerly known as Reva Electric car company. The company is involved in the design and manufacturing of compact electric vehicles. Mahindra & Mahindra (M&M), the parent company, acquired EV maker Reva to boost the development of electric vehicles. In November 2021, M&M has announced plans to launch 16 EVs by 2027 across SUV and light commercial vehicle categories.

List of electric vehicles offered by Mahindra electric are:

- Mahindra eVerito
- Mahindra eSupro
- Mahindra Treo
- Mahindra Treo Zor
- Mahindra eAlfa Mini
- Mahindra e20 plus

SUMAN MISHRA

Chief Executive – Mahindra Electric Mobility Ltd.

Q: How do you view the Indian EV Market?

A: The electric three-wheeler market is at an inflection point in India driven by increasing fuel prices, and supported by subsidies. Customers generate significant savings while driving electric vehicles. For example - a Mahindra Treo owner can save up to Rs 2 lakh on fuel, over a period of five years, when compared to a traditional CNG-powered auto. This translates to a low running cost of just 50 paise per kilometre. In Q2, we have reported a 300% growth with 68% market share, strongly demonstrating our capability in the electric three-wheeler space.

Infrastructure for charging and financing remain a challenge and this is something we are constantly working with our ecosystem partners.

Q: What are your future plans?

A: We have an upcoming wide range including electric vehicles, all in different stages of evolution, making our product portfolio very exciting.

Q: Please share your views on how the Indian government is doing on supporting the EV sector with its policies & other initiatives?

A: The Indian government has been very supportive of the electric auto sector. Subsidies in the form of FAME incentives have helped motivate both manufacturers and the customers, increasing the adoption of electric three-wheelers. The recently introduced Production Linked Scheme (PLI) now includes electric quadricycles. So far, only two-and four-wheelers were included in this scheme. The PLI scheme aims to boost the local manufacturing capacity of automakers and at the same time promises sustainable mobility, encouraging innovations on the way. More and more state governments are also adding to the incentives thereby equating the price of EVs to those of their ICE counterparts. The forward looking approach of the Indian Government has undeniably made electric autos a very attractive proposition for customers.

Tata Motors

Tata Motors is an Indian multinational automotive company headquartered in the city of Mumbai, owned by the Tata Group, that manufactures passenger vehicles, trucks, vans, coaches, buses, construction equipment and military vehicles.

In 2019, Tata Motors launched the Nexon EV and Tigor EV. The Nexon EV is the electric version of the Tata Nexon. The Nexon EV uses components from Tata Motors' EV technology brand "Ziptron". The Tigor EV is the most affordable electric sedan available in the market. Tigor EV was launched in 2021 with 4 new



TIGOR-EV Source: CarWale

variants XE, XM, XZ+ and XZ+(o). All variants adopt the Ziptron powertrain shared with the Nexon EV.

Tata Motors Chairman Natarajan Chandrasekaran has announced that Tata plans to introduce 10 new electric vehicles in India by 2025 and will also set up a pan-India charging infrastructure. The electric version of the Altroz is expected to be launched in late 2021.

The range of vehicles offered by Tata Motors are:

- Tata Nexon EV
- Tata Tigor EV
- Tata Altroz EV



Hero Electric

Hero Electric, a part of the Hero Group, is India's first electric 2-wheeler manufacturer that strives to make the country green with zero pollution transportation through a wide range of two wheelers. These electric two-wheelers are manufactured at the Hero Manufacturing Facility in Ludhiana.

Hero Electric offers a wide range of electric two scooters like the Photon X, Optima HX (dual battery), Optima HX (single battery), Nyx HX, Optima LX, Nyx LX, Flash LX and Atria LX. It has also launched an e-cycle, known as Velocity. With an aim to boost the existing charging infrastructure in India, the company has launched the charging stations with in-house design and development for anywhere, everywhere charging and door step service called the Electric Bike Assistant (EBA).

Hero has formed and established the Society of Manufacturers of Electric Vehicles (SMEV), it has also introduced innovative technologies like Range Extender, Personal Charger, Charging Station, Easy Wheels.

Recently, the company announced a partnership with Bengalurubased EV charging startup Charzer to install 1 lakh charging stations across India over the next three years.

Source: Hero Electric

Ashok Leyland

Ashok Leyland is the second largest manufacturer of commercial vehicles in India, owned by Hinduja Group. It is an Indian multinational automotive manufacturer headquartered in Chennai.

Ashok Leyland launched its first electric bus circuit in 2016 and eventually the Circuit S at the 2018 Delhi Auto Expo. The company has partnered with Sun Mobility to enhance its expertise in electric vehicle domain and introduce battery swapping in electric buses to meet the needs of e-mobility in the country.

In July 2021, Ashok Leyland consolidated the group's entire electric vehicles business into a new company called Switch Mobility. The company has announced the launch of an electric van in India by the end of December.

Ather Energy

Ather Energy is an Indian EV company founded in 2013 by Tarun Mehta and Swapnil Jain. It offers two electric scooters - Ather 450X and Ather 450 Plus, designed to address various problems in the EV twowheeler segment such as slow charging, low power motors as well as short battery life, among others.

The company is also offering Ather One plan that includes unlimited data services for the dashboard along with public and domestic charging, breakdown assistance and more. It has also set up an electric vehicle charging infrastructure called Ather Grid across the country.

Last week in October, the company announced the launch of its next generation of public fast charging infrastructure - Ather Grid 2.0. It will support OTA updates, allowing Ather Energy to roll out new



Ather 450 X Source: Ather Energy

features and bug fixes to all systems on the field. The company has also announced that Grid 2.0 has improved durability as it is designed to handle degradation, making it more suitable for installations exposed to extreme environmental conditions. Furthermore, The Ather Grid 2.0 will be connected 24*7 to provide real-time availability of all charging locations in each city.



Ola S1 Pro Source: Ola Electric

Ola Electric

Ola Electric Mobility, Indian electric two-wheeler manufacturer, founded in 2017, is based in Bangalore. It is a wholly owned subsidiary of Ola Cabs' parent ANI Technologies, the manufacturing plant is located in Krishnagiri, Tamil Nadu, India.

Ola has launched two electric scooters: OLA S1 –

- It has maximum speed of 90kmph
- Peak power of 8.5kW
- Range of 121km Ola
- S1 PRO -
- It has maximum speed of 115kmph
- Peak power of 8.5kW
- Range of 181km

Kabira Mobility

Kabira Mobility is an Electric Vehicle Startup, founded in 2017 by a team of Engineers led by an Aeronautical Engineer Mr. Jaibir Siwach to provide green energy mobility solutions to the country. Kabira Mobility Pvt. Ltd. (KM), had made its debut in the Indian Electric Vehicle industry at AutoExpo 2020.

KM aims to be a pioneer in the field of Electric Mobility & Integrated Transportation System that makes future mobility smart, accessible and most importantly affordable for the public.

Kabira Mobility launched KM3000 & KM4000, its High Speed Flagship Electric Bikes earlier this Year in February 2021. These bikes had received an overwhelming response from the community by gathering 6000 bookings under 96 hours.

These high-speed bikes are equipped with Combi-brakes, fast charging on-board and roadside assistance, making them as appealing as the ICE motorbikes in terms of style and performance. Kabira Mobility Electric bikes sport modern design with a sleek aerodynamic profile, fireproof battery, park assist and many smart & exciting features.

SPOKESPERSON

Kabira Mobility

Q: What do you have to say about the Indian EV market?

A: The Indian Automotive Industry contributes nearly 8% of the Annual GDP of the Nation and is currently facing a paradigm shift with the nation shifting towards the Electric Mobility platform. India is the largest market for two-wheelers which accounts for 81% of the 21.5 million total vehicles running across the length and breadth of this huge nation.

This transition mirrors the global shift towards electric mobility, driven by the perceived need for improved air quality, reduced dependence on oil imports, climate action, and decarbonization of end-use sectors.

MARKET SIZE

As per JMK Research estimates, the Indian E2W Market is likely to grow from 1,55,000 units in FY2021 to about 34,50,000 lakh units by FY2025 (CAGR of 87%). This push will be mainly driven by certain key Factors such as

KEY MARKET DRIVERS

- Strong Government Push
 - FAME-II Subsidy
 - State EV Subsidies
- Rising Fuel Costs
- Zero Maintenance on Electric Vehicles
- No Fuel Cost on Electric Vehicles
- Technological Developments
- Smart Mobility

All these Factors will lead to the growth of Electric 02 Wheeler Market in the coming Years.

CHALLENGES FOR THE EV MANUFACTURERS

- One of the Biggest Challenges that the EV Manufacturers would face is the Lack of Charging Infrastructure present across the Nation causing the Non-Urban Riders to hesitate while buying an Electric Vehicle
- Supply Chain Shortage also poses a Challenge for the E2W Manufacturers making it difficult to Scale up the Production and meet the demands.
- Supply Chain Challenges for Lithium Ion Battery Packs and dependency on other Nations for Cell Imports
- Low Quality Cell Imports to save the cost resulting in Poor Battery Pack Quality
- Lack of Awareness about the Electric Vehicle Technology for the Automotive Market resulting in lack of adoption of the Electric Vehicles.
- The Recent Decline in Economic Activity due to the COVID-19 Pandemic has also shown a challenge to the EV Industry.

One of the most overlooked aspects in the market today is Corporate Delivery. Ever since the COVID 19 Pandemic the concept of Home Delivery has become quite popular and has given rise to the Delivery Industry such as Swiggy, Zomato, Amazon, Dominos etc. There are almost 7.5 Million Deliveries made every day making the Delivery Industry one of the Largest Mobility Segments in the Nation with a Market Value of almost 2500 Crores.

However, the Current ICE Infrastructure is becoming a challenge for the delivery companies due to the Increasing Air Pollution, Rising Fuel Costs, Increased Maintenance and the Lack of Fleet Management Solutions in the ICE Scooters making it unreliable for the Long Run.

Keeping this in Mind, Kabira Mobility has launched Hermes 75. India's First Hi-Speed Delivery Electric Scooter. Having a top Speed of 80kmph and a Range of 120km on a Single Charge it allows the Rider to make deliveries effortlessly. Swapping Infrastructure allows the Rider to operate with Zero Downtime and Fleet Management Dashboard makes it easier for the Companies to Manage their Fleet effortlessly.

Adoption of Electric Delivery Fleet would also result in a Cleaner Environment and Smarter Delivery Platform.



Ultraviolette Automotive

Ultraviolette Automotive, a Bengaluru based startup established in 2015. It manufactures premium electric motorcycles and is backed by TVS Motor Company Limited. UltraViolet is planning to set up a smart network of city-based charging points starting from Bengaluru.

Ultraviolette is all set to launch its first electric bike – F77 in 2022, the F77 has no gearbox or clutch, just twist the throttle and the electric motor does the rest. It has a top speed of 142kph and acceleration from 0-100kph in 7.8s. The 138kmph mark claim set by the KTM Duke-200 has been surpassed by the F77. With a production capacity of 10,000 units, Ultraviolette Motorcycles is manufactured at the facility located in Bengaluru.



Ultraviolette F77 Source: Ultraviolette Automotive



Revolt RV300 Source: Revolt Motors

Revolt Motors

Founded by Rahul Sharma (co-founder of Micromax), Revolt Motors is an Indian electric two-wheeler startup backed by Rattan India. It is the next generation mobility company and is going to introduce India's first AI-enabled motorcycle.

Revolt's mission is to create the future of next generation mobility with 100% accessibility and 0% fuel residue and its vision is to democratize clean commuting using next-gen mobility solutions.

Revolt offers two electric bike models', these are Revolt RV300 and Revolt RV400. These e-bikes have a swappable battery and a subscription-based pricing system, and are currently available on sale in various locations such as Pune, Delhi, Ahmedabad, Hyderabad and Chennai, with Revolt 'hubs' located in these cities. The manufacturing

plant of Revolt is located in Manesar, Gurgaon. The company is also planning to introduce an e-bike named 'Café racer' and electric scooter in the future.

Simple Energy

Electric scooter manufacturer, Simple Energy, founded in 2019, is a start-up based in Bengaluru. In August 2021, Simple Energy launched Simple One, its first electric scooter in the Indian market. The simple one has four riding modes - Eco, Ride, Dash and Sonic, it has a power output of 4500W and a combined braking system for both the wheels. It offers a 7-inch touchscreen, Bluetooth connectivity, navigation, vehicle tracking, tire pressure monitoring system and 30 liters of storage capacity.

Simple Energy also launched its EV charger called Simple Loop which can charge its scooter up to a range of 2.5 km in 60 seconds. Simple Energy is aiming to install more than 300 public fast chargers in India in the near future.

In November 2021, TVS Motor Company and Simple Energy



Simple One Source: Simple Energy

pledged to invest over Rs 2,000 crore to set up e-scooter manufacturing units in Krishnagiri and Dharmapuri districts, in yet another boost to Tamil Nadu, emerging as an electric two-wheeler hub.

ZEVpoint E Mobility

ZEVpoint is an Indian public charging networks provider, based in Gurgaon, Haryana. ZEVpoint's vision is to establish a network of EV charging stations pan India by providing efficient charging solutions for home, business & commercial needs. Their emphasis is to make the charging experience simple and fast for the end consumers. In the coming times ZEVpoint will be charging the cars like we charge mobile phones today, at home, offices, airports, hotels etc.

AKAASH JAIN

Founder, Zevpoint E-mobility

COMPANY'S VISION, RECENT DEVELOPMENTS AND FUTURE PLANS

- With more than 1500 different interactions across the spectrum in the last one year, Zevpoint has managed to create a prototype for both the physical and software product and has formed collaborations with various establishments to set up charging stations.
- On a daily level the company brings across various charging solution queries and given the high trust value, the company makes sure that each request is dealt with, analyzed and
 provides tailored solutions, keeping in mind the benefits for its end customer.
- ZEVpoint has set an aim of installing at least 1000 charging stations in the next 3 years for EV cars. The company is already in talks with various hotel chains, offices & societies etc. and the response has been highly positive for its charging solutions. ZEVpoint app allows the end customer to use the facility with the simple touch and manage the charging of their car by themselves without the need of an operator.

Q: How is the Indian EV sector doing right now?

A: There is no doubt Electric Mobility is going to significantly change how we look at the automobile industry today. With countries like US & Europe leading the race of EV revolution it is time for India to buckle up and be a part of it. Following the trends, there has been a lot of talking going on regarding the EV uptake, infrastructure & relevant policies from 2013. Right from the National Electric Mobility Plan 2020, FAME 1&2, EV30@30 plan & and with various trade policy changes, we are seeing a push from the government as well to increase the adoption rate. India right now is seeing an exponential penetration of EVs in 2/3 wheelers with 4 wheeler following relatively slower. Due to reasons like the easier registration of two-wheelers and three-wheelers under the FAME policy, high volume of 2/3 wheelers on road along with lower capital expenditure is driving their penetration more than 4 wheelers & other public transport facilities.

Even though after a lot of forward steps, there are various hurdles that are yet to be resolved such as lack of infrastructure (charging stations), standardization for the equipment, cost parity of EVs with IC vehicles. It is not like people have not heard of EVs nowadays, now we are at a stage where people are asking more questions about it like is it economically viable, will it save me money as compared to an IC vehicle etc. Various automobile brands like Tata, Hyundai, & MG etc. are coming forward with new models in the mid-range segment which will provide momentum for this adoption rate. In the higher segment brands like Jaguar, Audi & Mercedes Benz have also entered the race.

ZEVpoint is working towards the aim of providing efficient charging solutions for business & Commercial needs which are required to bridge the infrastructure gap. There have been various opportunities created in the process, whether it may be production of EVs, Infrastructure facilities such as production of chargers, software services for the management of these facilities and much more. You can see a number of startups popping up in the last few years itself trying to cater to these requirements. Even after the COVID impacted the industry heavily in the last two years we are seeing a strong rebound in the second half of 2021.

Q: Please share your views on how the Indian government is doing on supporting the EV sector with its policies & other initiatives?

A: So India's EV mission of having 30% share of EVs cars by 2030 currently requires aggressive policy changes. Currently we have had 13 states coming up with or notifying their EV policies, and upon analysis you can see focus on EV purchase benefits have been high but only a few states focused on manufacturing & infrastructure benefits. The need of the hour is to upscale the infrastructure & establish large scale domestic manufacturing for various equipments & components of EVs not just for manufacturing but also for providing smooth after sales services. An independent study by CEEW Centre for Energy Finance indicates that it would need around 29 lakh public charging stations by 2030 to support EV adoption under the base case target of NITI Aayog.

A step in this direction which was observed recently was the Production linked Incentive scheme for Battery storage manufacturing since the battery itself comprises 30-40% of the cost of EV car. In the coming time with the increase in the number of EVs, demand for electricity will also rise which will require significant improvements from current levels. Along with this fact, most electricity generating plants in India are Coal dependent so we need alternative energy projects to match the increasing demand in order to reduce the dependency on these limited fossil fuel resources for the EV revolution to be a real success.

ENVIRONMENT IMPACT OF EVS & REDUCTION ON OIL

To highlight the intensity of the situation, Exhaust from on-road diesel vehicles is responsible for nearly half of 181,000 premature deaths worldwide and two-thirds in India, France, Germany, and Italy. Among the 100 major urban centres assessed for transport sector-related deaths globally, New Delhi ranks sixth. Along with this, 11 out of the 12 most polluted cities on a World Health Organization list were in India. Keeping in view the climate change commitments made by Government of India during the COP21 Summit held at Paris to reduce emission intensity by 33-35% by 2030 from 2005 levels, it is pertinent to introduce alternative means in the transport sector which can be coupled with India's rapid economic growth, rising urbanization, travel demand and country's energy security.

"With the increasing levels of pollution, we have reached a point where we are already using air purifiers, you try and think of this scenario a couple of decades back, people would laugh at it" said Akaash. India is fighting its biggest war with pollution, with 16 out of 20 of the most polluted cities in the world today. This current state of affairs did not go unnoticed by Aakash Jain and he felt the urge to do something about this scenario. He got the chance to travel in a Tesla during his trip to Canada and experiencing travel in this electric marvel, and realizing the potential it has, convinced him that EVs can actually be a one of the solutions to curb the rising pollution in India. "Along with a diverse team Akaash started working on researching the industry's potential and the roadblocks that were preventing the penetration of EVs. Analysis of 3 areas- Production, Infrastructure and Services highlighted that the value chain lacked proper infrastructure solutions. At Zevpoint, we are offering people that infrastructure and providing them with end to end charging solutions for electric vehicles,' says Aakash Jain, Founder, ZEVpoint.



Source: Lohia Auto

Lohia Auto

Lohia Auto Industries is one of the largest electric automobile manufacturers in India. It was established in 2008 to design, manufacture and market electric two wheelers, three wheelers and diesel three wheelers to make transportation smart and affordable.

Lohia Auto Industries is headquartered in Noida, Uttar Pradesh and has a production plant in Kashipur, Uttarakhand which produces all listed products for the Indian market. Lohia Auto has taken the next step in electric vehicle development in the Indian market and produces high performance electric vehicles that are efficient, lightweight and fast of the line, loaded with advanced technology and fun to ride. On 26 September 2014 UM Motorcycles, USA joined hands with Lohia Auto to form UML - UM Lohia Two Wheelers Pvt. Ltd. This strategic partnership will introduce the Indian audience to

unique products developed specifically for the Indian market. Lohia Auto offers a range of electric scooters, electric three wheelers as well as e-autos in India. The Comfort e-Auto HS by Lohia Auto was launched in 2018 at the Delhi Auto Expo which offers a load capacity of 40 kg and offers seating for five people including the driver.

eBikeGo

eBikeGo is one such platform from India that offers electronic mode that lasts for around 100km after electronic charge for about 2 hours and makes daily movement fast with a top speed of 55km/h.

During the pandemic, eBikeGo has increased the number of vehicles in its fleet from 300 e-scooters to 2,100 e-scooters.

Recently, eBikeGo has acquired the rights to manufacture the smart electric trike 'Velocipedo' in India, from Torrot. With this, eBikeGo is planning to enter the luxury electric three-wheeler industry and aims to manufacture these scooters. The Velocipedo offers the benefits of an electric scooter in a much safer and easier way.



Etrio

Etrio is an electric vehicle startup based in Hyderabad, Telangana. The company's product portfolio includes electric vehicles in payloads ranging from 75 kg to 750 kg, which includes a new three wheeler product range in both cargo and passenger segments under the brand "Touro" and a retrofitted e-LCV.

The electric vehicle segment offers a great business opportunity for Indian manufacturers across the value chain which includes manufacturers, traders as well as service providers. Concerns over electric vehicle range as well as uncertainty about charging infrastructure are creating hurdles in the adoption of electric vehicles in the country. The adoption of EVs will largely depend on government policies and stakeholders such as OEMs, startups, charging infrastructure developers as well as battery manufacturers to come together and aim for collaborative partnerships.

Ref:

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DEEPAK MV CO-FOUNDER & CEO, ETRIO

"The EV market in India is currently growing in leaps and bounds. Today, we are seeing that even the most prominent automobile players who once used to make ICE vehicles are now rising to the occasion of manufacturing electric vehicles that give optimum results both on-road and off-road, and also support a zero-emissions, cleaner and greener future. As EV sales pick up in India, enabling end-customers with better financing options (to buy EVs) and building many more EV charging stations across the cities and towns of our country will be imperatives to overcome challenges like range anxiety and Total Cost of Ownership. The Indian Government's vision to become a 100 per cent electric vehicle nation by 2030 is laudable. Also, it is heartening to note that many state Governments have come forward with e-mobility friendly policies and major EV subsidies -- which will obviously go a long way in enabling large scale EV transition. As one of the leading electric 3W EV OEMs in the country, we at Etrio are working committedly with a vision of 'electrifying intra-city movement and logistics' and transforming the environment, lives and businesses of EV owners. And to that end, we are driving EV adoption across the country through a two-pronged approach: one, our unique e-lease model for logistics and last-mile delivery players and second, our dealership model for expanding into the B2C and B2B segments by collaborating with dealer-partners in various parts of India."



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Battery Management System and its role in EV battery performance improvement

🚈 DR. PRASHANT SHRIVASTAVA & ROBIN KUMAR

Emuron Technologies Pvt Ltd

.....

e are currently witnessing a surge in the demand of Lithium-ion batteries for electric vehicles (EVs). As the Lithium-ion batteries shares the high proportion of overall EV cost, though it becomes mandatory to make it more efficient and reliable. However, due to highly dynamic nature and high sensitivity of Lithium-ion batteries to operating conditions like temperature, C-rate, and DOD %, it is challenging to keep it in the safe operating areas. Therefore, it is required to understand the functions and topologies of existing Battery Management System as it helps to improve the EV battery performance.

Global EV Market Scenario (2020 - 2030)

As countries work to reduce carbon emissions, the demand of EVs is increasing. According to IEA, the global and plug-in hybrid EV (PHEV) sales share in 2020

was 4 % and 16 % of total vehicles sale. As demonstrated in Fig 1, by 2030, under the states policies scenario, the EV and PHEV sales will be reached to 16 % and 33%, respectively. Under the sustainable development scenario, EV and PHEV sales will touch 34 % and 31%. Currently, the use of EVs is dominated in the developed like China, USA, France, Japan, Norway, and South Korea. However, this trend is also started to influence many developing countries.

Indian EV market: In developing countries like India, the central and states government drafting the policies to support OEMs and consumers. The global EVs market is expected to reach a value of USD 725.14 billion by FY2026 which will have a major impact on the EV company shares in India, as shown in Fig 2. According to CACR, EV market share in India is expected to increase from USD 5.3 billion (2020) to USD 206 billion by 2030. the demand for EV batteries would create an



Fig 1. Global EV market scenario, 2020-2030





Fig 2. EV market growth in India in the FY 2019- FY2030

investment opportunity of USD 17 billion. To meet the goal, demand for EV charging infrastructure would create an investment opportunity of USD 3.2 billion in the EV charging stations market. Under FAME II, around INR 193.57 crores were given out as incentives till FY 2021 by the government.

Why are Lithium-ion Batteries the backbone of EVs?

As we know the Lithium-ion batteries have several prominent features that make it suitable for the use in EV such as high energy/power density, long life cycle, low self-discharge, and no memory effect. Also, their characteristics to support fast charging made it ideal for EV. However, for the safe operation of Lithium-ion batteries it is mandatory to operate it in the safe operating area (SOA). For example, if we operate lithium-ion batteries beyond its temperature range then it would not be possible to charge it completely. Moreover, if we continued to operate outside its temperature limit then the problem of thermal runway may occur and ultimately catch fire. Also, the high depth of discharge (DOD) can easily affect its cycle life. Therefore, to keep the Lithiumion batteries in the SOA, the electronic chip called battery management system (BMS) is used by the battery manufacturers.

Price and demand of Lithium-ion batteries (2010-2030)

Typically, the prices of the battery pack are measured by the cost per kilowatt-hour. The prices of the battery have fallen over the last 10 years, as the production of battery reached economic scale. According to BloombergNEF, today's price of battery is \$156 per kilowatt-hour, which is around 85% decline in prices from 2010's which was around \$1,100 plus/kWh cost. According to BloombergNEF, the prices of battery will continue to falls, it will reach below \$100/kWh by 2024, as the production and efficiency of battery is continuously improving. The cumulative demand for lithium-ion batteries is also increasing, it was just 0.5 gigawatt-hours in 2010, rises to roughly 526-gigawatt hours in 2020. This enormous increase in demand is expected to be continue, which may reaches upto 9,300 gigawatt-hours by 2030, as show in Fig 3. That demand for battery will transform in 10s of millions of energy storage, electrical vehicles, and consumer devices around the world.

Sources of safety hazards in Lithium-ion batteries used in EV

There are different sources of safety hazards in EV batteries during their long life such as manufacturing defects, thermal abuse, electrical abuse, and mechanical abuse as shown in Fig 4. Cell with manufacturing defect caused by the contamination of the chemical is hard to identify after the battery pack development and may trigger the thermal runway. Thus, it is always recommended to adopt rigorous quality control procedure in the battery assembly line. As Lithium-ion batteries is highly sensitive to temperature and rising the



Fig 4. Safety hazards of EV batteries

temperature beyond the defined limit may trigger the thermal runaway due to undesirable side reactions. Also, the heat generation during thermal stress cannot be controlled. Mechanical stress commonly occurs during accident and it may cause due to many reasons such as compression, punching and twisting of cells connected the battery pack and damage of shell casing. The electrical abuses that commonly occurs in the EV batteries are due to malfunctioning of the protection circuitry and mishandling are:

- over-voltage
- overcharge
- over-current
- external short circuit
- charging outside of the accepted
- over-discharge, and fast charging of overdischarged cells
- deep discharging

If the EV battery remains in the electrical abuse condition for longer/multiple time, it will increase the thickness of SEI layer and form the dendrite on the surface of electrodes. Due to SEI layer thickness increment, the internal resistance of the battery will increase. Other side, with the formation of dendrites, the separator can be punctured, and internal short circuit will occur. The mechanical, electrical, and thermal abuses are the main cause of triggering of thermal runaway and fire of EV



Fig 3. Lithium-ion battery market growth for EV

batteries. However, With the use of BMS EV batteries can be protected from the thermal runaway to some extent.

The functionality of BMS and existing topologies

BMS is an electronic system that serves as the brain of the battery system. As shown in Fig 5, some of the key functions of BMS are charge and discharge control, thermal management system, cell monitoring, balancing, fault diagnosis and and health management, data acquisition, and modeling and state monitoring. The economic advantages of BMS are extensions of battery lifetime and lowering the cost. For example, BMS shares only 8% of the total battery pack cost for a 22 kWh mid-size EV battery pack. Standardization of BMS for EVs and proper implementation of the standards in EVs can reduce risks and hazards associated with BMS significantly.

Data Acquisition: The data acquisition includes the monitoring and storing of the most relevant battery data for decisionmaking units of BMS. The most relevant battery data are the measured voltage of every battery-connected battery cells, the current flows in parallel connected modules in the battery pack, and the temperature of each battery cells. The proper sampling frequency of voltage and current measurement is always required to capture the transient response of the battery cells.

Thermal management system: LIBs are very sensitive to temperature. The increase in temperature has two effects on the performance of Lithium-ion batteries. With the increase in temperature, the Lithiumion battery's performance improves and works more efficiently. Therefore, to maintain the temperature within the safe operating temperature range, the thermal management system is generally equipped with a battery pack.



Fig 5. Functions of the battery management system

Safety and Protection: To protect the battery cells or battery pack from malfunctioning and permanent damage, different sensors are incorporated with BMS. With the help of sensor signals, the battery cells can be protected from overcharge, undercharge, insulation fault, uniformity fault, over-fast temperature rise, and low temperature. When the faults are diagnosed, the sensor signals are transmitted to the vehicle control unit to handle the faults. Under a serious fault condition, the vehicle control unit disconnects the battery pack from the power supply also.

Charge and discharge control: All batteries have limited numbers of charge and discharge cycles, so this function of battery should be properly managed for better life

and deep discharge case may be occur in few cells. This also impact the performance, operation, and safety of battery pack. To outperform this, the cell balancing circuit is available in BMS. Generally, there are two types of cell balancing methods are used in BMS such as active cell balancing and passive cell balancing. Passive cell balancing is also known as dissipative cell balancers and active cell balancers as non-dissipative cell balancers.

Battery States *monitoring:* For development of robust and efficient BMS, various battery states need to monitor accurately such as State of Charge (SOC), State of Health (SOH), State of Power (SOP) and State of Energy (SOE). However, these states of battery cannot be



Fig 6. Schematic of different BMS topologies

Cell Balancing:

Due to inconsistency among the cells, battery the small imbalance in voltages of the battery cells is always present. Due imbalance in voltage, overcharging measured directly through any electrical instruments. Therefore, these states are estimated through various methods using measureable quantities of batteries such as battery terminal voltage, current and operating temperature.

BMS Topologies

Selection of suitable topology in large size BMS is very crucial task to optimize the cost. BMS topology defines the connections between the individual cells to monitor, control structure and communication architecture. The BMS topologies can be classified into three categories as Centralized, Distributed, and Modularized or Master-Slave, as shown in Fig 6. Further, the properties of different properties are listed in Fig 7.

Centralized BMS Topology: One master controller is monitoring each cell and control the overall functioning of battery pack.

Distributed BMS Topology: All the cells have its BMS that sends signals to Master controller to control the functioning of battery pack.

Modularized BMS Topology: Different identical slave module BMS connected with individual batteries or battery cells for monitoring and controlling. In which, one of the modules BMS serves as Master BMS and control the overall functioning battery pack based on the signals send by the slave BMS.

Selection criteria for right BMS

- Compatible with desired battery chemistry: As the characteristics of different chemistry batteries vary greatly from each other. Hence, the BMS must support the desired chemistry according to the battery pack.
- Number of series cells: BMS must have the feature to support the maximum number of cells in series available in a battery pack.
- Max. Current and Voltage Rating: Selected BMS current and voltage rating must be slightly higher than the continuous current rating and maximum voltage so that it doesn't struggle from the demand of the controller,

Properties	Topologies		
rroperues	Centralized	Distributed	Modularized
Complexity	High	Low	Low
Cooling	Easy	Difficult	Difficult
Independent Operation	No	No	Yes
Reliability	Low	Low	High
Installation and Maintenance	Difficult	Depend on type of cells	Depend on type of cells
Cost	Low	High	High

Fig 7. Properties of different BMS topologies



Fig. 7. Features of next generation of BMS

respectively.

- Max. Balancing Current: Large balancing current results in less time required for balancing of battery pack but it may also cause thermal problems if thermal management is not well supported.
- Estimated SOC accuracy: Better SOC accuracy results in less drifting of SOC, if BMS have less SOC drift from actual SOC, prevents battery from deep discharge or overcharge conditions.
- Sensor's accuracy: Selected BMS must have a better sensor rating for better measurement of temperature, voltages, and current values which are also used in SOC estimation of battery.
- Communication method: CAN 2.0 is necessary for the automobile domain, BMS must be able to support UART communication for wireless peripherals such as Bluetooth, wifi, or an IoT device, according to customer requirements.
- Maximum channel per slave: Depending on the battery pack voltage range, the requirement of the voltage channels per

slave generally varies.

 Programmable input and output: Programmable input and output pins result in large numbers of application or

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What should be in the Nextgeneration BMS?

Next-generation BMS should be different from traditional BMS in different aspects to improve the life cycle and performance of EV Lithium-ion batteries. Some of the features of next-generation BMS are:

- It should have the capability to celebrate with real-time data instead of laboratory data.
- It should be capable to work with a 5G high-speed information system and bandwidth so that the advantages of big data and cloud computing will be fully utilized. So, the limitations of computation power ad storage capacity in traditional BMS will be reduced significantly.
- It should have the feature to adjust the degree and rate of charge based on health especially during fast charging.
- In the next generation BMS, the concept of digital twin should be utilized to improve the data logging.
- With the application of an advanced coestimation algorithm for SOX (SOC, SOH, SOP, and SOE) estimation in next-generation BMS more reliable and cost-effective Lithium-ion battery pack will be developed.





Auto OEMs + Tech Startups = Connected, Autonomous, Shared Electric Ecosystems (CASE)

SARTHAK NAYAK Havells India Ltd.



or shaping up the Autonomous Ecosystem, yesterday's selfcontained Automotive OEMs & Tier 1 suppliers are coming together & grabbing the opportunity in partnering, investing, acquisitions & more than anything accepting Technology primarily in the following space:

- Ride Sharing & P2P Car Rental Platforms
- Advanced Driver Assistance Systems (ADAS)

Mobility Models (Ride Sharing & P2P Car Rental Platforms):

OEMS & CORPORATE VENTURE CAPITAL / VC	RIDESHARE / P2P CAR RENTAL
Ford (Fontinalis Partners)	Cargo, Zoomcar, Turo, Zagster (\$), Chariot (+)
General Motors (GM Ventures)	Lyft, Yi Wei Xing (\$), Maven, Sidecar (+)
Fiat Chrysler Group, PSA Group (Stellantis)	KooliCar (\$)
Volvo (Geely, Volvo Ventures)	Uber, RidePal, CaoCao(\$), Luxe (+)
Volkswagen	Gett (\$), Quicar, Europcar (+)
Daimler (Daimler Mobility Services)	Moovel [Car2Go, Ridescout, Hailo, BlackLane, Turo(+), Careem (\$))]
BMW (BMW I Ventures)	ReachNow (+), Scoop Tech, May Mobility, Fair, Turo (\$)
Daimler	Intelligent Apps (+), Via, Blacklane, Turo (\$)
Audi (Audi Electronics Ventures)	SilverCar (+)
Tesla Motors	Tesla Share (Tesloop)
SAIC Motor (SAIC Capital)	GetAround, YourMechanic (\$)
Honda (Honda Xcelerator)	Grab (\$)
Toyota (Mirai Creation Investment, TRI)	DiDi, Uber, Getaround, Grab, May Mobility, JapanTaxi (\$)
Hyundai / Kia Motors (Hyundai Ventures)	Ola, Grab, Revv, LUXI (\$)
Renault-Nissan-Mitsubishi	Marcel, Klaxit
Mercedes Benz	FlightCar (+), Via
NIO Motors (NIO Capital)	Dida, Shouqi Limousine & Chauffeur(\$)

OEMS	ADAS (SENSORS / CAMERA / LIDAR / RADAR)
Ford (Ford Smart Mobility, Fontinalis Partners)	Velodyne Lidar, Ouster (\$)
General Motors (GM Ventures)	Aeye, Oculi (\$)
Fiat Chrysler Group, PSA Group (Stellantis)	Waymo (~), Magneti Marelli (\$)
Volvo (Geely, Volvo Ventures, Volvo Cars Tech Fund)	Luminar, Fortellix (\$), Autoliv, Zenuity (~)
Volkswagen	TuSimple (\$)
Audi (Audi Electronics Venture)	e.solutions (+)
BMW (BMW I Ventures)	Nauto, Autobrains, Lunewave, Blackmore Sensors(\$)
Daimler (Daimler Trucks NA)	Quanergy Systems, Luminar (\$)
Caterpillar (Caterpillar Ventures)	TriLumina (\$)
SAIC Motor (SAIC Capital)	Robosense (\$)
Honda (Honda Xcelerator, Honda Strategic Venturing)	GM'S Cruise (\$)
Toyota (Mirai Creation Investment)	Autobrains, Nauto (\$)
Hyundai / Kia Motors / Mobis (Hyundai Ventures)	Velodyne, StradVision, Metawave(\$), Uiwang(~)
Renault-Nissan-Mitsubishi	Prophesee, Mobileye, Chronocam (\$)
Nio Motors (NIO Capital)	Innovusion (\$)

- Machine Learning / Artificial Intelligence
- Mapping & Localization Technology
- Connected Car (Telematics, Infotainment)
- Cyber Security
- Electric Vehicles & Charging Infra

OEMs' R&D Center moving from Michigan to California, Money flowing from China to US.

OEMs are following Unicorns like Uber, Lyft to adopt & strategise to various transport-mobility innovations which may be in the form of pay-per-use models such as car sharing, carpooling and peer-to-peer car rentals. OEMs have been investing, acquiring or launching their own ride sharing venture. For example: General Motors recently invested in Lyft, acquired SideCar & jointly started his own ridesharing venture Maven. GM even invested in ride share tech platform provider of China: Yi Wei Xing, where the OEM is simultaneously also experimenting the evolving nature of ride sharing models in different markets & creating ways for expanding its services in the big markets.

Advanced Driver Assistance Systems (ADAS):

The broad penetration of Autonomous Vehicles is not only accelerating the development of various new technologies like advanced & multiple sensor communication & fusion, GPS Positioning, Image Recognition and Computer Vision but also bolstering the development of Robotics and drones. Both could get benefit from using the same infrastructure including recharging stations, service centers & M2M communication networks. A standard technical architecture for making transportation autonomous, lies on the following stages of development:

- Multiple Sensors Technology (Camera, Radar & Lidar)- for taking visual pictures of infrastructure & traffic conditions.
- Sensor Fusion- where different sensors inputs are synthesized into the software algorithm for detection of vehicle moving towards/away/alongside you.
- Autonomous Engine (AI & Robotics)which automates the vehicle functions like steering, accelerating & braking in

OEMS	AI
Ford (Ford Smart Mobility, Fontinalis Partners)	Argo, Phantom, Invision (\$), Quantum Signal, Nutonomy, SAIPS (+)
General Motors (GM Ventures)	Algolux, Helm AI, Momenta, Nauto (\$), Cruise (+), VocalIQ
Fiat Chrysler Group, PSA Group (Stellantis)	Waymo (~)
Volvo (Geely, Volvo Ventures)	Lytx (\$)
Tesla Motors	DeepScale(+)
Volkswagen, Porsche	Argo AI (\$), DFKI, Inrix (~)
Audi (Audi Electronics Venture)	TTTech (+), Cubic Telecom (\$), Mobileye (~)
BMW (BMW I Ventures)	Kodiak Robotics, Plus One Robotics, Recogni, Zendrive(\$), Nauto
Daimler	Momenta, Blaize,(\$), Torc Robotics (+)
Caterpillar (Caterpillar Ventures)	OTTO Motors (\$)
SAIC Motor (SAIC Capital)	Momenta, Plus, Black Sesame, TRON (\$)
Honda (Honda Xcelerator)	Cruise (\$)
Toyota (Mirai Creation Investment)	Momenta, Pony.AI, Preferred Networks (\$)
Hyundai / Kia Motors / Hyundai Mobis (Hyundai Ventures)	Aurora, MORAI, Allegro, Deep Glint, Perceptive Automata, IonQ(\$)
Renault-Nissan-Mitsubishi	WeRide (\$), Ejenta
Mercedes Benz	Momenta (\$)
NIO Capital	Momenta, Trunktech, Black Sesame(\$)

Mapping and Localization:

OEMS	МАР
Ford (Ford Smart Mobility, Fontinalis Partners)	Civil Maps, Humatics (\$), TransLoc (+), Baidu (~)
Fiat Chrysler Group, PSA Group (Stellantis)	Navteq, TomTom (~)
Volvo (Geely, Volvo Ventures)	deCarta (+ by Uber), HERE (~)
Volkswagen	Google Maps
Audi (Audi Electronics Venture)	HERE (+), DutchMap, TomTom (~)
BMW (BMW I Ventures)	HERE (+)
Daimler	what3words (\$), HERE (+)
SAIC Motor (SAIC Capital)	what3words, Savari (\$)
Honda (Honda Xcelerator)	Dynamic Map Platform (\$)
Toyota (Mirai Creation Investment)	Dynamic Map Platform, Zenrin(\$)
Renault-Nissan-Mitsubishi	Microsoft (~), Dynamic Map Platform (\$)

real time within a splash of a second. OEMs invest & acquire in the space primarily for developing right technological expertise & ventures which integrate the hardware and software systems.

For Example: Ford along with Baidu jointly invested in Velodyne LiDAR (subsidiary of Velodyne Acoustic which manufactures audio equipment, subwoofer products). Velodyne brought down the cost of LiDAR system from \$80,000 to \$500 and visions to bring it to \$100, which can produce 300K-1.2M data points per second, which are interpreted by the system's algorithms to create highresolution 3D images. These images can be used for mapping {by Civil Maps (Ford's Investment)} to help a car understand the surroundings & avoid collision detection. Ford & Baidu earlier partnered for offering infotainment services in China in 2013. Baidu (Google of China), is setting up an R&D center in Silicon Valley, plans to develop autonomous car software whose OS for driverless car called Baidu AutoBrain integrates Baidu's MyCar car-connectivity, CarLife synchronization software for mobile devices & Maps. Changan Auto's cars which use Baidu's 3D Maps has a joint venture with Ford.

The joint investment venture of Ford as an OEM & Baidu as a tech venture is not just going to help the Ford's Driverless Car plans but the complete automotive OEM & Tier-1, 2 supplier's ecosystem for developing cost

Yehicle Engineering is taking a transition from Mechanical to Electronics to Software effective autonomous cars.

Artificial Intelligence:

Deep Learning & AI will play a key role in mimicking the human neural networks, will enable the road to fully autonomous vehicles since they allow detection & recognition of multiple objects, improve perception, reduce power consumption, support object classification, enable recognition & prediction of actions, which will naturally reduce development time of ADAS systems. AI based systems are also going to play important role in Manufacturing Production Lines & Crash Testings by reducing significant time & cost in the process.

For Example: Bill Ford's VC arm (Fontinalis Partners) invested in nuTonomy (MIT spinoff), autonomous vehicle software startup to develop self-driving taxi service in Singapore for testing its platform

Connected Car (Telematics, Infotainment):

OEM	CONNECTED CAR (TELEMATICS / IVI)
Ford (Ford Smart Mobility, Fontinalis Partners)	Motorq, FreshCar, Pivotal (\$), Livio Connect (+)
General Motors (GM Ventures)	Wejo, Telogis (\$), Onstar
Fiat Chrysler Group, PSA Group (Stellantis)	Uconnect, QNX, Masternaut
Volvo (Geely, Volvo Ventures)	Forciot (\$), Wireless Car (+)
Volkswagen, Porsche	WirelessCar (+), SeeReal, Mobvoi (\$), ZYNC (\$)
BMW (BMW I Ventures)	Ridecell, Parkmobile (\$)
Daimler	Hap2u, Zonar Systems, Platform Science(\$)
SAIC Motor (SAIC Capital)	KOTEI (+), Banma, Sonatus, iSMARTWAYS, CalmCar(\$)
Toyota (Mirai Creation Investment)	KDDI (~), Soracom(\$)
Hyundai / Kia Motors (Hyundai Ventures)	Kardome, SoundHound, Autotalks, Envisics, 42dot, Ottopia(\$)
Renault-Nissan-Mitsubishi	Gestigon (~), Sylpheo (+)
NIO Capital	Autolink (\$)

OEMS	ADAS (SENSORS / CAMERA / LIDAR / RADAR)
OEMs	Cyber Security
Ford (Ford Smart Mobility, Fontinalis Partners)	Karamba Security (\$)
Volvo (Geely, Volvo Ventures)	Upstream Security (\$)
BMW (BMW I Ventures)	Upstream Security, Alitheon, Claroty(\$)
SAIC Motor (SAIC Capital)	Guardknox (\$)
Hyundai / Kia Motors (Hyundai Ventures)	Upstream Security(\$)

Electric Mobility & Charging Infrastructure:

OEMS	EV STARTUPS / EV CHARGING / ENERGY ANALYTICS SOFTWARE
Ford (Ford Smart Mobility, Fontinalis Partners)	Highland Electric (\$), Spin (+)
General Motors (GM Ventures)	Lordstown, Nikola, Proterra (\$)
Volvo (Geely, Volvo Ventures)	Polestar, FreeWire, Zeekr, Faraday Future (\$)
BMW (BMW I Ventures)	ChargePoint (\$)
Daimler	ChargePoint, Proterra, Hubject (\$)
SAIC Motor (SAIC Capital)	WM Motor, Powerwise (\$)
Honda (Honda Xcelerator)	Ubitricity, Moixa Technology, Virent (\$)
Toyota (Mirai Creation Investment)	24M (\$)
Hyundai / Kia Motors (Hyundai Ventures)	Ola Electric, Arrival, Rimac, HiiROC, Ampup (\$)
Renault-Nissan-Mitsubishi	JMEV (+), Jedlix (\$)

in Mitsubishi iMiev, Renault Zoe Vehicles.

Two major players specialize in digital worldwide Map database creation: HERE & TomTom. HERE (acquired by coalition of Audi, BMW & Daimler), named George Vehicles using high precision GPS, motion tracking inertial system, laser scanners and 4 cameras develops HD Maps; while TomTom captures Depth Maps using LiDAR. Both HERE & TomTom develop low-level aerial information which could be used by Drone makers for navigation because of which even Drone Delivery ventures would be interested to partner with Mapping companies.

To complement autonomous transportation ecosystem, Telematics will play a key role in monitoring and managing a fleet of autonomous pods through collation & analysis of data, & also in tracking any kind of malfunctioning of the pods through software & hardware analysis. Telematics Service provider may devise a Pay-peruse and premium subscription model which can be sold on contractual basis for maintenance, diagnostics, infotainment and content streaming for autonomous transportation. **For Example:** BestMile, a Swiss based startup is providing a cloud-based fleet management platform designed to connect, operate & optimize any fleet of autonomous vehicles. It has recently launched "SmartShuttle" in Switzerland, in partnership with PostBus, the largest provider of public bus transportation. It has even partnered with Navya Technology France, NEXT Future Transportation Italy, Hi-Tech Robotic Systemz India in which electric autonomous shuttles are managed.

Virtual Reality will play a key role in assisting the development of various In-Car Infotainment & V2X communication features through diverse gesture recognition mediums which would enable to create different Autonomous Features.

Cyber Security:

The more vehicles become connected & automated, the more concern will be on Cyber Security. Recent successful hacking of Jeep Cherokee & Tesla Model-S has attracted interests among both investors & entrepreneurs to venture out in automotive cyber security. Autonomous Vehicles can be hacked even by Terrorists for causing massive damage in traffic systems. Argus Cyber Security & Karamba Security, Arilou Technologies are currently solving this problem.

References:

LEGEND		
Sign Means		
\$	Investment	
+	Acquisition	
-	Partnership	

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EV charging infrastructure to serve as important catalyst in global deep decarbonization ventures

Ever-increasing decarbonization efforts and the rise of electric mobility underpin the importance of robust EV charging infrastructure for sustainable transport in the future.

A SALONI WALIMBE

Global Market Insights Inc.

n a world facing the prevailing threat of climate change and increasing emissions, decarbonization is the need of the hour. The need for deep decarbonization technologies is growing rapidly, particularly due to factors like fossil fuel combustion, which is a major source of global GHG emissions. This has brought the transportation and mobility sector under intense scrutiny of late.

The path to decarbonization requires industries, like transport, to revamp their energy consumption patterns to fit more sustainable mobility demands. This is important, considering that transport is singlehandedly responsible for nearly 20% of the world's energy-related emissions, causing over 80% of the city-dwelling population to be exposed to pollution levels way beyond the limits set by the WHO (World Health Organization). To address these issues, the mobility sector over the last few years has been making targeted efforts to transition from conventional ICE (internal combustion engine)-powered vehicles to electric vehicles (EV).

According to the US Department of Energy and Electric Power Research Institute, EVs are poised to represent nearly 40% of new car purchases in the United States by 2030, registering a rise of almost 2%. However, if electric mobility is to endorse deep decarbonization economywide, significant investments are required in the EV charging infrastructure market, which is set to surpass \$61 billion by 2027, based on a Global Market Insights Inc. report.

Government initiatives to private sector investments – the driving forces behind global e-mobility adoption

EV evolution is gaining massive momentum worldwide, garnering support from the government and private sectors alike. Major initiatives are underway across the globe to promote the wider adoption of electric mobility solutions. From governments worldwide, these initiatives have mainly emerged in the form of multiple policy initiatives and investments targeted towards accelerating EV adoption.

To illustrate, in February 2021, the Singapore government introduced a new EV rebate slated for launch in 2022, as part of its EV Early Adoption Initiative. As part of this effort, the government has pledged to set aside S\$30 million over the upcoming five years, to bolster EV-related initiatives, including measures aimed at enhancing EV charging provisions at private premises. The private sector has also made its contributions to this movement, with major automakers including Volvo, VW, GM, BMW, Audi, and Nissan pledging to make a cumulative investment of \$150 billion towards EV manufacturing and announcing their intention to introduce new EV models throughout the 2020s.

Aside from vehicle availability, a successful transition towards e-mobility hinges on a critical factor; the development of a robust EV charging infrastructure. According to estimates from the WEF, businesses and governments will be required to spend nearly \$500 billion by 2040, to establish 290 million additional charging points for electric vehicles. The COVID-19 crisis also added impetus to the EV transition to a certain extent, with numerous economic stimulus packages being launched for battery storage and charging infrastructure development in prominent regions like Europe.

Countries like France, Germany, Sweden, Italy, and the Netherlands are testament to this, introducing national targets and policies that encourage the development of EV charging technology, ranging from fiscal incentives to grants. The German government, for example, decided to extend various stimuli to boost the sales of both commercial and personal electric vehicles, in November 2020.

These incentives included an extension of innovation premiums to 2025, as well as requirements and subsidies for EV charging infrastructure expansion. The stimulus for charging stations also included the creation of fast-charging infrastructure

EV CHARGING INFRASTRUCTURE MARKET Global Market Insights



Source: Global Market Insights Inc.

with a minimum of 150 kW at former gas facilities. The objective behind this move was to expedite the German government's efforts to equip at least a quarter of all its pitstops with fast-charging infrastructure by 2022 end.

Public charging infrastructure development to address EV range anxiety dilemma

It is becoming increasingly apparent that the future of mobility is electric, with EVs positioned at the center of the transition. As the EV ecosystem continues to evolve, however, certain challenges are emerging as barriers to widespread EV uptake, most notably limitations associated with charging infrastructure. Range anxiety is being cited as a major roadblock to EV adoption by potential car buyers in recent years, given the uncertainty that still surrounds EV technology, especially when it comes to charging. Based on a report from Volvo, nearly 58% of drivers claimed range anxiety as a barrier for the purchase of an electric vehicle.

The growing focus on the improvement of charging provisions in workplaces and other public areas is helping alleviate this anxiety. GMI analysts suggest that the EV charging infrastructure industry from the public sector was worth almost \$8 billion in 2020. The establishment of wide-ranging public infrastructure for EV charging is essential, not just due to the constant surge in EV use, but also to make sure that modern electric vehicles are as convenient and cost-effective as their conventional counterparts.

In order to support this, steady additions to EV charging infrastructure are needed over the years ahead. Estimates from the ICCT suggest that workplace and public charging stations need to increase by 27% each year, to facilitate consistent EV growth through 2030. To that end, Royal Dutch Shell Group in February 2021 announced its intention to invest \$5 billion to \$6 billion in its EV initiatives, including the establishment of over \$00,000 charging locations by 2025.

North America leads the charge in expansion of infrastructure for electric mobility

The EV charging infrastructure industry in North America is projected to amass significant proceeds over the years ahead, especially in the U.S. given the robust EV movement in the Pacific Northwest and California. Based on a report from California New Car Dealers Association, new BEV and PHEV registrations in the state reached almost 130,000 in 2020, accounting for nearly 8% of all light vehicles. The state is also known for its strong policy structure pertaining to electric vehicle adoption, including the Zero-Emission Vehicle (ZEV) program, a part of California's broader vision to improve air quality and reduce GHG emissions, designed to incentivize EV sales.

Several companies across the nation are also taking up crucial projects to design, develop and fund the development

66

Range anxiety is being cited as a major roadblock to EV adoption by potential car buyers in recent years, given the uncertainty that still surrounds EV technology, especially when it comes to charging



of charging infrastructure for electric mobility.

Electrify America, for instance, introduced its "Boost Plan" in July 2021, intending to expand its EV charging infrastructure in Canada and the U.S. by almost double, with plans to establish over 1,800 fast-charging stations and install 10,000 individual chargers by the end of 2025. With the objective of boosting the deployment of 150 kW and 350 kW chargers – the fastest of their kind – this plan is expected to blaze the trail for a stronger EV future in North America.

Meanwhile, General Motors announced plans in October 2021, to install close to 40,000 Level 2 EV charging stations across Canada and the United States, to uplift EV interest. The company is among the many giants of the automotive industry to make targeted transition efforts towards electric models of all vehicles by 2030. GM has also pledged to a complete phase-out of diesel and gas vehicles by 2035 and make a shift to EV models. The initiative is set to commence in 2022 and is a part of GM's recent investment commitment of almost \$750 million to enhance the workplace, public, and home electric vehicle charging infrastructure via its new Ultium Charge 360 ecosystem.

EV proponents ramp up R&D efforts to push towards new horizons in sustainable mobility

With the era of electric vehicles approaching, the emergence of novel and innovative charging technologies is a fundamental driver for the upcoming green transport revolution. Manufacturers and organizations worldwide are focused on increasing their R&D activities to meet this need and are undertaking various



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Content Writer Global Market Insights Inc.

An avid reader since childhood, Saloni is currently following her passion for content creation by penning down insightful articles relating to global industry trends, business, and trade & finance. With an MBA-Marketing qualification under her belt, she has spent two years as a content writer in the advertising field. Aside from her professional work, she is an ardent animal lover and enjoys movies, music and books in her spare time. strategic efforts to boost the EV ecosystem.

For instance, in October 2020, scientists from INL (Idaho National Laboratory) began working collaboratively with XENDEE Corporation on a U.S. DOE Microgrid Program-funded project, for the designing, modeling, and simulation of Fast Charging Station Microgrids, built to provide optimum EV charging whilst minimizing electrical grid impact.

In November 2020, DEWA (Dubai Electricity and Water Authority) registered a new patent following the development of a universal smart EV charging system by researchers at its R&D Center. The system is designed to charge all types of EVs, irrespective of whether they use DC or AC, with a single plug and cable. The design of the charging stations, which is aimed at being as user-friendly as possible, helps simplify the EV charging process and allows all EV drivers to charge their vehicles easily.

ABB is also making its contributions to this cause, notably through its launch of a new all-in-one EV charger in September 2021, designed to provide the fastest charging experience in the market. The new charger, dubbed Terra 360, is modular in design and is built for simultaneous charging of up to four vehicles, via dynamic power distribution. The objective behind this launch was to not just accommodate the charging needs of private EV drivers at convenience stores, fueling stations, and retail locations, but also to create a robust charging network on commercial premises which could cater to the charging needs of electric fleet vans, trucks and cars.

The industry's earlier reticence towards switching completely to new mobility solutions has created considerable barriers to EV adoption over the years. However, things are beginning to change gradually, with constant efforts from the automotive sector and regulatory agencies alike to advance EV charging technology, which is key to addressing the ever-prevalent range anxiety issue. Although the complete transition to EVs worldwide may still be a work in progress, enhancements to the EV ecosystem, especially in terms of charging infrastructure development could prove extremely beneficial for the transport industry in its quest for achieving its vision of a more sustainable mobility future. \Box



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HOW IOT IS HELPING EV BUSINESS

ARAJESH SARANGI Teltonika India

lectric Mobility is booming in India due to the sharp focus of the Government in promoting EV and increasing awareness about environment-friendly fuel alternatives. With initiatives from the government to promote electric vehicles coupled with reduced cost of key elements (i.e batteries), India is poised for a quantum jump in the EV segment. As per the statistics provided by Vahan Parivahan Portal, in India, the sales of EVs have increased by 80% in 2021 compared with last year. However, in comparison to 4-wheelers, the EV 2-wheeler and 3-wheeler are gaining ground faster. Taking advantage of this opportunity, several startups have ventured into the market to cater for the need of growing demand for EVs. The Indian government is also encouraging the citizens to adopt EV through various schemes like FAME, as this will protect the environment as well as meet the target to reduce environmental pollution. The adoption of EV is also helping India to decrease dependency

on fossil fuel, eventually leading to a reduction in imports.

The introduction of electric vehicles has brought up new use cases. Electric Vehicles have a low total cost of ownership. Thus, many companies have come up with new business models like bike-sharing, last-mile delivery, hyperlocal delivery using EV as a solution. Even the material handling equipment like forklifts, stackers, scissor lifts operate on electric batteries with high load handling capacity. This has necessitated additional infrastructure requirements of battery charging stations and battery swapping stations. With the rising demand for EVs, there are challenges as well. Functionalities related to the range of the vehicle, security against theft, health parameters of the battery, battery technologies etc. require attention.

The battery is the most critical component in EVs. Accordingly, the security and performance of the battery is a concern to many OEM's. Battery parameters like SOC & SOH are important aspects for the monitoring of battery health, errors could lead to damage or mishaps if ignored. Bike sharing, last-mile delivery applications need security of their vehicles along with the battery status so that it would be easy to track and trace the vehicle and to swap or charge the battery in case the battery is discharged. These businesses are also looking for a keyless and automated process enabling them to monitor and control the bikes remotely, while the end-user can take a bike without a key.

So how IoT could help in the EV business?

Solutions lot Provides to Ev Market

BMS Monitoring

Ridesharing, last-mile delivery, and leasing companies can monitor the BMS parameters (battery voltage, current, charge and discharge rate, available range of the vehicle) of a vehicle and generate more revenue. They can also disconnect the batteries from the vehicle in case



of a rise in temperature or any other defects to prevent the potential damage. This can be done when an IoT device is supported by various BMS protocols like CAN, UART, RS485, or RS232.

Ease of Leasing Batteries

Battery parameters and location tracking are essential features for battery swapping and leasing companies. Batteries swapped can be tracked and monitored by the swapping stations. IoT can help in tracking the batteries and prevent the theft and loss of the battery.

Theft Proofing

Initial prices of EVs are more expensive than IC engine-based vehicles. 2-Wheelers are prone to theft, a battery is expensive, and IoT could assist in more effective tracking. The battery comprises 40% of the cost of EV's. It is necessary to protect them from theft, thus, theftproofing these vehicles brings more importance. EVs are also used by bikesharing and last-mile delivery companies for food delivery, cargo delivery, hyperlocal delivery etc. In such situations, EVs can be tracked by using IoT in case they are stolen. These IoT devices can also raise an alarm and alert the owner about the theft.

Immobilization

IoT devices can help us in immobilizing the vehicle in case of theft or misuse. With immobilazer a vehicle can be controlled with additional sensor or controlled via an app. Immobilization could help businesses, for example, bikesharing companies, to protect their EV's from theft.

Geo-Fencing

Geo-Fencing is the virtual fence on a





EVs are the future. and without any doubt combustion engines will be replaced by EVs, this brings in a lot of challenges like optimizing the battery performance, search for new generation of batteries also to reach that level where we can power up heavy vehicles, ships Aero planes with batteries. This also brings in opportunities to make our vehicles smarter safer and more efficient, and IoT has been helping us in the same.



map to prevent the vehicle from crossing the marked territory. The function of geofencing could also send an alarm to the owner or the user when a vehicle enters or exits the geofenced area. This could help bike- sharing companies, hyper-local deliveries if they are breaching the territory, and the users would be alerted as well.

Driving Behavior

A user's driving behaviour is a critical parameter in determining the range of a vehicle and its life span. Excessive idling, overspeeding, acceleration and sharp turns are needed to be monitored as these scenarios directly affect the battery life, discharge rate, range, and vehicle lifespan. It can also prevent accidents on the road and overspeeding bills, as well as increase the safety of the user. Fall Down / Crash Detection

Fall Down / Crash Detection

IoT devices have built-in accelerometers which can monitor the acceleration and angle. So, the sudden change in acceleration and angle can be detected, and the owner or the company can be alerted about a fall down or crash. This can also be useful to inform about severe accidents.

Predictive Maintenance

Using an IoT we can detect the charge cycle of the vehicle, kilometers traveled, etc. and this data is used for maintenance of the tires, lubrication cycle, battery life, and monitoring other wear and tear parts of the vehicles. This could help in preventing the damage to the vehicle by preventing the use of the wear out parts and increasing the life of the vehicle and its batteries.

Work Hours Monitoring

Forklifts, Scissor lifts, cleaning equipment running time or work time can be monitored by the simple use of an IoT device. Crash or physical impact on such expensive equipment can also be detected utilizing the same IoT device, and, consequently.

Keyless Access to the EV's

IoT comes with the help of many ride-



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Mr. Rajesh Sarangi is an adept Business Management professional with 15 Years of experience in Business Consulting, B2B and Go to Market Strategy . With core experience of Automotive Sector, he holds distinction in Product Strategy, Network Development & Project Management as well.He is currently leading the India operation for the Mobility Division of Teltonika .

sharing companies that provide keyless access to their customers with mobile phone authentication or other BLE beacons. There are 2 ways by which a customer can unlock a bike using a Bluetooth connection. The first would be by authenticating the key using Bluetooth AES128 security, connecting the mobile app to the device via Bluetooth. The second way comes with the use of a Bluetooth identification beacon to authenticate the rider of a bike. These methods help businesses to automate the process of bike booking and sharing by reducing the effort of sharing the physical key at the docket station. The concept of a docket station can be also discarded, as the bike can be locked or unlocked at any region using an IoT device. This increases the ease of using ride-sharing vehicles as they can be made available in any possible region.

Overcoming Challenges by Using IoT

Many times, users abuse the shared vehicle by driving inappropriately and leaving the shared vehicle outside their docket station. Such incidents can lead to theft, tow, or even damage to the vehicle. In such cases, the IoT solutions can help identify such behavior of the user and prevent the loss of the vehicle. A solution provided by the IoT would encourage companies to address various challenges and make them successful in business models of bike-sharing, last-mile transport and provide a way for an easy commute to the market.



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Noida +91 120 4211330-32 / Hyderabad +91 40 47766104 / 105

DAO ZOR 405

India's new start-up electric two wheelers manufacture company DAO India launched the company first's modern electric moped ZOR 405 in India. The DAO ZOR 405 is the new high speed attractive stylist looking modern electric moped from DAO line up. The price of DAO Zor 405 starts at Rs. 75,656.



SPECIFICATIONS

Engine and Transmission:

- Drive Type Hub Motor
- ♦ Motor Type BLDC
- Motor Power 2100 W
- Range 70 km/charge
- Starting Remote Start, Push Button Start
- ◆ Transmission Automatic

IoT Features:

- ◆ Geo-Location identification
- Real time Battery status
- Real time Range estimate
- Smartphone-as-scooter-key
- Anti-theft locking system
- ♦ Trip Data
- Repair
- Statistics and records of previous ride & Last
- On Board App diagnostics
- Pre-emptive maintenance and history report

Features and Safety:

- Gradeability 13 degree
- Digital Speedometer
- Digital Tripmeter

- ◆ Digital Console
- Additional Features Charger 4-7 A, Reinforced Front Basket, Emergency Rescue System, Intelligent Release System, One-Click Repair Function, Hazard Switch, Reverse Button
- ♦ Display

Chassis and Suspension:

- ♦ Body Type Electric Bikes
- Front Suspension Telescopic Fork
- Rear Suspension Double Shocker

Dimensions and Capacity:

- Length 1800 mm
- Width 700 mm
- Height 1050 mm
- Saddle Height 720 mm
- Ground Clearance 190 mm
- Kerb Weight 80 kg
- ♦ Load Capacity 250 kg

Electricals:

- LED Headlight
- ◆ LED Tail Light
- ◆ LED Turn Signal Lamp
- ♦ Battery Type Lithium Ion
- Battery Capacity 60 V, 23 Ah



THE NEW MINI COOPER SE

Mini which is a part of BMW Group announced the imminent launch of Mini Cooper SE. The pre-bookings were opened on October 29 at RS. 1 lakh. The car will be available in four unique paintwork colours – White Silver, Midnight Black, Moonwalk Grey and British Racing Green. The company has announced that all of the 30 units that were heading for retail have been pre-booked.

OXI9 IAA

Ball I



SPECIFICATIONS

Engine and Transmission:

- Max Power (bhp@rpm) 181.03bhp
- TransmissionType Automatic

Fuel & Performance:

◆ Fuel Type – Electric

Charging:

- 0-80 percent in 35 minutes via a 50kW charge point
- 11kW wall box can charge it from 0-80 percent in 150 minutes or 210 minutes on a full charge.
- Total Torque 270 Nm

Multifunctional Instrument Display

Digital instrument cluster consists of a 5.0 inch / 12.7 cm colour screen in a sleek Black Panel design and provides details like your revs per minute, speed, charge level, mileage, temperature and navigation instructions.



SUZUKI AVENIS

The Suzuki Avenis is powered by a 124.3 cc air-cooled engine which produces of power. It has a fuel tank of 5.2 L. The Suzuki Avenis starts at Rs 86,700 and goes up to Rs 87,000. It is available in two variants.





SPECIFICATIONS

Engine

- Engine Type: 4- Stroke, 1-Cylinder, Air Cooled
- ◆ Valve System: SOHC, 2-Valve
- Displacement: 124.3 cm³
- Bore x Stroke: 52.5 mm X 57.4 mm
- Engine Output: 8.7ps @ 6750 rpm
- Torque: 10Nm @ 5500 rpm
- Fuel System: Fuel Injection
- Starter System: Kick and Electric
- Transmission Type: CVT

Electrical

- Battery: Maintenance Free 12V, 4Ah
- ♦ Headlight: LED

Dimensions & Weight

- Overall Length: 1,895 mm
- ♦ Overall Width: 710 mm
- Overall Height: 1,175 mm
- ♦ Wheel Base: 1,265 mm
- ◆ Ground Clearance: 160 mm
- ♦ Seat Height: 780 mm
- Kerb Mass: 106 kg
- ♦ Wheels: Alloy
- Fuel Tank Capacity: 5.2 L

Features and Safety

- ♦ Shutter Lock
- ♦ Charging Point
- ◆ Mobile Connectivity: Bluetooth
- Digital Speedometer
- ◆ External Fuel Filling
- Digital Odometer
- ◆ Digital Tripmeter
- Digital Fuel Gauge
- Digital Console
- Pass Switch
- Navigation
- -----

Additional Features

Front Box with Usb Socket, Sporty Muffler Cover, Long Floorboard, Side Stand Interlock, Front Rack For Storage, Phone Alert, Eta Update



Telematics in Electric Vehicles

KIRAN MANOHAR DESHMUKH

SONA COMSTAR

ata is the new currency, and the collection and analysis of data are helping us solve many problems while increasing efficiency at the same time. Vehicle telematics essentially means the activity of vehicular data collection and its analysis. This data can be simple data, like the history of a vehicle's movements. However, it can get extremely granular and complex, with sensors around the car possibly collecting data about the vehicle's health, fuel consumption, and sometimes even the concentration levels of the driver. All this data can then be collated,

presented, and analysed in myriad ways. Vehicle telematics has found its space in vehicle fleet management systems to help optimise the fleet's operations. UPS were the first enterprise to recognise the power of telematics and apply it to its fleet of vehicles, achieving great success.

With telematics getting helpful in analysing various parameters of a vehicle and helping optimise it, it was logical that it would get involved in the next big step in personal mobility: the Electric vehicle. The electric vehicle concept is not new; some of the first commercially available electric vehicles were available in the 1890s. However, fossil fuels took over, and for the next century, they ruled our roads. However, the need for more environmentally conscious and sustainable mobility has made us come full circle back to electric vehicles. Telematics isn't a new technology, either – the 1980s saw quite a few research programs funded, and GPS technology was available to consumers by the early 1990s.

Electric vehicles: the good, the bad, and the improvements sought.

Electric mobility is the obvious way forward for a few reasons: they are much

more efficient than fossil-fuel-powered vehicles, and it isn't even close. They are over twice as efficient as the most efficient petrol or diesel cars. Suppose the electricity sourced to run the electric vehicle comes from renewable resources like wind or solar energy. In that case, it utilises resources that would otherwise be wasted and help reduce climate change. However, battery technology does not allow them to recharge as quickly as their fossil fuel counterparts. You need at least an hour with a quick charger to top up a regular EV and their 'tank range' in comparison to the vehicles of today leaves a lot to be desired. This has given rise to range anxiety, which formerly affected only the motorcyclists with large engines and small fuel tanks. With battery technology improving by leaps and bounds, it is only a matter of time until electric vehicles offer range capabilities that are second to none. Interestingly, the journey to that point will be dictated by vehicle telematics.

Vehicle Telematics: The Next Step

GPS data allowed vehicle fleet managers to track vehicles, but advancements in the tech used onboard vehicles allowed us to follow a lot more data. For example, the amount of fuel consumed in a particular vehicle—if much more than other similar vehicles in the fleet—indicated a problem. The data transfer in real-time allows preventive measures like a tyre pressure monitoring system issuing a warning about a puncture or a driver monitoring system raising an alert about a driver who is sleepy or distracted to respond to an emergency. These advancements have come hand in hand with progress in the cloud and the Internet of Things, not to mention the advance of greater data bandwidth available to the consumer like 4G and 5G.

Vehicle Telematics in Electric Vehicles

Electric Vehicles have a very simple driveline, but managing it can get tricky when considering the ever-changing parameters a vehicle has to deal with, like the load, speed, acceleration, etc. We've had over a century to refine the fossil-fuelpowered vehicle, and some of that data can be used to help shape the responses of an electric car. Still, with the various energy efficiency demands included, a vehicle's system quickly grows in complexity. For example, regenerative braking needs to harvest the vehicle's kinetic energy, use the motors that drive it as generators this time, and charge the batteries - but the traditional brakes are still available on standby, in case hard braking is required. The switch from one system to the other is one that telematics can dictate. In addition. various other systems, like the HVAC system, the lights, the cooling system, etc., need optimisation. All this falls to the vehicle's onboard computer, and all of this data can be used to optimise things further. Since there is such a high degree of electronic intervention in all systems of an EV, it is quite possible to bring about significant improvements in the vehicle's performance and efficiency via software updates, not unlike electronic devices such as smartphones and computers.

Range anxiety is undoubtedly the biggest hurdle in an all-out adaptation of EVs. Vehicle telematics can help an EV user select a route that involves less traffic or goes past the nearest quick charging station – and can be refined further to redirect the vehicle to the closest available charging outlet as well. Fleet managers can use vehicle telematics to assign appropriate cars for a job. The same logic can be applied to self-drive fleets that are increasingly available in developed cities across the globe.

Even a personal EV owner benefits from vehicle telematics in a straightforward sense; the EVs of today with Internet connectivity will allow you to lock or unlock the car, start the air conditioning system, etc., all remotely with a smartphone loaded with the appropriate app. This can be expanded to offer vehicle alerts to the manufacturer if a vehicle system looks increasingly likely to fail, thus helping avoid a bad experience during a journey for the driver and reducing downtime for fleet managers.

India will be more concerned with the electric two-wheeler market since it will make up the overwhelming majority of sales here. Even here, telematics can make its mark for many of the same reasons.

AUTHOR KIRAN MANOHAR DESHMUKH Group CTO

Sona Comstar

Kiran Manohar Deshmukh holds a bachelor's degree of technology in metallurgical engineering from the Indian Institute of Technology, Bombay. He has significant experience in automotive components manufacturing and has worked in the areas of, among others, manufacturing, process control and design. He was honored with the Ashoka award by the Indian Society for Quality in 2006.

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With telematics getting helpful in analysing various parameters of a vehicle and helping optimise it, it was logical that it would get involved in the next big step in personal mobility: the Electric vehicle.

Currently, financing for electric twowheelers does not meet the same levels as traditional ones because of a lack of data. Also, knowing the usage of riders will allow us to refine designs that will work for the Indian market, which offers many unique challenges to automotive manufacturers. A small but possibly important part of vehicle telematics can be the prevention of theft or recovery of a stolen vehicle.

The Final Step: The Autonomous Vehicle

The pinnacle of vehicle telematics is, of course, the autonomous vehicle. Trials are being conducted in different places globally and have been going on for years now, with varying degrees of success. The autonomous car will minimise energy consumption, travel time, and road accidents and undoubtedly increase productivity for those who might need to commute to work. The ideal vehicle will be autonomous – and electric. All of this will not be possible without telematics in electric cars.







Toposens launched ECHO ONE DK, uUltrasonic Echolocation Sensor for 3D collision avoidance. The industrial grade sensor development kit, called ECHO ONE DK, is based on the company's 3D ultrasonic technology, which is designed to mimic a bat's echolocation techniques.

The ECHO ONE DK Set includes: A 3D Ultrasonic Sensor plus three software packages:

- Toposens sensor Library (C++-Library)
- ROS support
- Cross-Platform Toposens 3D Visualizer

Additionally, there is a separate interface adapter for firmware updates.



KEY FEATURES:

- 3D Multi-Object Detection Generate
 3D echolocations (X/Y/Z) of the sensors surroundings
- Ultra Short-Range Detection 3D data from 20cm
- Ultrawide Field-of-View At Ultra shortrange up to 180° and at 3 m up to 110° (horizontal)
- Best-in-Class Detection Capability –
 Detect dark, transparent, complex and small objects
- High Robustness Immunity to lighting conditions and IP67 protection class
- Compact Design and Flexible Mounting Flat housing design and seven screw holes
- Easy Software Integration CAN and ROS driver delivering X, Y, Z data output
- Low Power Consumption 2.2 W average for longer robot uptime

SPECIFICATIONS

Technical Characteristics:

- Ultrasonic Frequency ~40 kHz
- Frame Rate Up to ~20 Hz (adjustable)
- 3D Operating Range 200 3000 mm
- Horizontal Field of View 200 600 mm up to ±90° 600 - 3000 mm up to ±55°
- Vertical Field of View 200 600 mm up to ±90° 600 - 3000 mm up to ±25°
- Communication Interface CAN 2.0A, default data rate 1 Mbit/s (other data rates/ interfaces on request)

Physical Characteristics:

- Dimensions 122 x 68 x 23 mm
- Weight 253 g (incl. cable)
- Protection Class IP67 (sensor unit)
- Fixed sensor cable D-SUB 15 female (others on request) 850 mm length (flexible part)

Electrical Characteristics:

- Supply Voltage (nominal) 12 V
- Supply Voltage Range 6 28 V
- Power consumption (average) 2.2 W (at 12 V)

Use Cases:

- AGV Collision Avoidance
- Autonomous Parking
- Passenger Detection
- Presence Detection







XAV-AX3200

Sony Electronics Inc. launched the new XAV-AX3200 car AV media receiver, featuring powerful audio and smart connectivity to enhance the in-car entertainment experience. The XAV-AX3200 will be available in December 2021.

• Firmware Upgradability

• DSO (Dynamic Stage

/ Sub x 1)

Organizer)

• Pre Out - 3 Pre (Front / Rear

 \odot

SPECIFICATIONS:

Size & Weight

- Dimensions (W X H X D) -178x100x139mm
- Wei 1.0kg

General Features:

• Output Power - 55W x 4



- Rear View Camera IN
 - 10-band Graphic Equalizer
 - USB
 - Extra Bass
 - Connectivity Bluetooth

Tuner Features

- Preset FM18 / AM12
- RDS / EON
- Auto Memory BTM

Bluetooth Profile

- HFP 1.6
- A2DP 1.3
- AVRCP 1.3
- PBAP 1.1



Bluetooth Features

- Speed Dial
- Recent Calls (# OF)
- Last Dialed Call
- Phonebook Access via PBAP
- Alphabetical Phonebook Sorting
- Ring Volume Level Control
- Call Volume Level Control
- External Microphone
- Battery Reminder
- Signal Strength Indication

Monitor(AVC)

- LCD TYPE TFT Active Matrix
- SCREEN ASPECT- 17: 9
- SCREEN DIAGONAL (INCH / MM) - 6.95 inch
- SCREEN SIZE (W X H MM) -156.6 x 81.6 (mm)
- RESOLUTION (DOT) 800 x 480
- DIMMER
- CONTRAST RATIO 400
- BRIGHTNESS 500cd / m2

User Interface

- TOUCH PANEL Yes / Resistive / AG
- GESTURE COMMAND
- REMOTE COMMANDER RM-X170
- PARKING CONTROL
- PARKING LINE ADJUST
- ASPECT RATIO SELECT
- REAR VIEW CAMERA-IN MARKER SETTING

Features

- Siri with Apple CarPlay
- Voice Control with Android Auto
- WebLink™ Cast compatible

- Anti-glare clear responsive touchscreen
- Easy installation with a compact rear chassis
- A/V input connectivity
- Build your own sound system
- Bluetooth[®] wireless technology
- Rear camera ready for easy reversing
- Powerful, clear amplification
- Dynamic Stage Organiser creates virtual speakers on your dashboard
- FLAC compatible
- Quick Wake-up









INDIA'S DIGITAL DREAM THRU GAME CHANGING 5G NETWORKS -OPPORTUNITIES FOR MOBILITY & BEYOND



n 11th and 12th November 2021, two days virtual conference on- 'India's Digital Dream Thru Game Changing 5G Networks- Opportunities for Mobility & Beyond' was organised by Society of Automotive Engineers India. As we are all

aware that we are just few weeks away from the 75th Anniversary of Indian Independence (Azadi ka अमृत महोत्सव). To commemorate the monumental occasion, SAE India dedicated this conference to mark a resurgent and Aatmanirbhar Bharat; aligning with Hon'ble Prime Minister Shri Narendra Modi ji's vision of building a new, Aatmanirbhar Bharat by the year 2022.

The virtual conference opened with welcome address from Mrs Rashmi Urdhwareshe, President SAE India and Director, ARAI. In her welcome address she mentioned about the



opportunity for the automotive industry with 5G technology about to make a launch in India. Dr Arunkumar Sampath, Chair MEB, SAE India mentioned about the role which Society of Automotive Engineer India has played in bringing awareness about new technologies which impacts the automotive industry. Further in his address on 'Setting the context' he mentioned about the deliberations which will take place in the two days virtual conference touching upon various opportunities which was going to unfold with 5G coming in. Lakshmi Amur, MD Tata Communication, Chief Guest for the conference gave an exhaustive overview of how 5G will impact various industry verticals from manufacturing to automotive. He touched upon various industry verticals which will benefit from 5G. Guest of Honour, Sunil David, AT&T mentioned how 5G will change the user experience with low latency and high device density besides the increased data speed coupled with reliability and security. Dr Maxime Flament, CTO, 5GAA talked how 5G will benefit V2X and specifically V2V. He gave some illustrative examples of some case scenarios where 5G enabled V2V would be helpful. The discussion which has been there for past few years, about which technology would be used for V2V amongst 5G and DSRC now seems to be coming to an end, with general acceptance of 5G, which will be ubiquitous in few years.

The two days virtual conference saw eminent industry leaders share their views about various industry verticals which will benefit. There seems to be general acceptance that 5G would embark a new era for connect vehicle and autonomous vehicle.



Electric Vehicle Ecosystem in the making: What's in it for each one of us?

naja pandian R

LDRA

he adoption of Electric Vehicles (EVs) from Traditional Internal Combustion Engine (ICE) has made tremendous progress in the past few years. It all began with the awareness of the environment bundled with innovations that led to an EV era.

Electric Vehicles (EVs) have never been more safe, sleek and bundled with driving features. The electricity that powers an EV must also come from other sources than conventional, enabling a more significant and cleaner electricity generating infrastructure.

The economic slowdown has shadowed most of the countries, including India. The future of the automotive industry, during these challenging times, would heavily depend on investments made in electric vehicles and related technologies. As India is becoming the manufacturing hub for EVs, the Government of India has announced the FAME II scheme supporting EVs to meet their sustainability goals. Startups are leading the race in electric vehicle development than the established OEMs like in the ICE space.

The startup and OEMs are in jeopardy between reducing EV costs and spending money to boost infrastructure, while the government, on the other side, is incentivizing the use of EVs. But has this addressed the vital questions related to longterm sustenance? Here are some issues that must be addressed both from an industry perspective and a consumer's perspective.



Figure 1: Safe and Secure Product Development Ecosystem and Stakeholders

• The cost of electric vehicles is still not affordable for an ordinary man, especially in the tightening economic condition.

- Distance apprehension is there sufficient charge to complete the drive/ ride?
- Is adequate charging infrastructure available for further adoption of EVs?
- How can we reduce dependency on battery and component imports?
- Are EVs secure in a connected environment?
- Does the industry have a skilled workforce to cater for the existing development environment?
- Do we have the right academic programs to enable continued innovations in the EV space?

Many new startups dominate the Indian EV segment in development and assembly activities. However, the key missing element is the lack of enough effort on fundamental research. Academic institutions are involved in fundamental research; however, making the technology viable and commercially affordable has been the biggest challenge.

Although there are various research initiatives globally taken to find an alternative combination for batteries – the primary source of vehicle power is brushless motors, where alternatives research efforts are not enough. A few areas where the industry can step up the fundamental research pieces concerning electric vehicles are supercapacitors, structural electronics, alternative power trains, energy harvesting and regeneration, traction battery systems, alternative/renewable charging sources, and the likes.

Apart from fundamental research, the awareness of safe and secure product development concerning process standards could help us build a world-class ecosystem, making India one of the prime EV hubs of the world. Involvement from various



Figure 2: CMVR – AIS Standards

stakeholders at a very early stage of product and technology development is a key enabler in achieving this. Understanding the importance of each stakeholder and their involvement in the product development environment benefits all parties mutually. Figure 1 depicts the stakeholders of the Safe and Secure Product Development Ecosystem.

Development Ecosystem and Stakeholders

Standard bodies play a vital role in ensuring that India becomes a pioneer in developing and implementing safe and secure products for future generations. Currently, multiple process standards are adopted for the safety and certifications of active sub-systems used in EVs. But international organizations are still struggling to develop a unified process standard that is accepted globally. There are multiple process standards for the hardware equipment and the supporting charging infrastructure. But let's not forget that any EV is a co-engineered and co-functioning of complex software working in tandem with hardware.

Neglecting the software safety and security would pose severe liability issues when scaling OEM's production capacity for export markets. The ISO Committee's industry standards catalogue 43 (Road Engineering) has an entire working group for Electric Road Vehicles, including components and systems. Indian Standard Bodies like CMVR (BIS/AIS) could adopt from multiple sub-committees in adopting an Indian specific standard, which could also be globally acceptable (refer Figure 2).

Only when a process standard get passed as a regulation, it is considered to be complete. And this regulation needs to be enforced by the regulators allowing minimal or no exception in the product development environment. OEM or a product development company will be capable of adhering to these regulations only when they have access to the right set of technology and service providers and achieve contributions from professional and industry bodies.

The current scenario encourages Indian stakeholders to scale up the regulation formation activities while engaging the entire ecosystem, resulting in the rapid adoption of process standards in the already vibrant EV development environment, filled with global auto majors and startup companies.

Standards-based Approach

ISO 26262 "Road Vehicles – Functional Safety" has successfully been implemented for all the automotive products developed. And recently, ISO/SAE 21434:2021 "Road Vehicles – Cybersecurity Engineering" was also published. We can expect these standards to play a significant role in all the current and upcoming automotive products.

The below image is an example of considerations as per ISO 26262 fitted in a

V model.

Here are some best practices that help the ecosystem build a safe, secure, and dependable system – capitalizing on the tailwinds of the current world situation.

- **Think long term.** Strategic Vs Tactical. Vulnerabilities evolve constantly. Considering long term loopholes and addressing the vulnerabilities as part of the entire development life cycle is critical.
- **Creative Mindset.** Testing a system, sub-system, or application for vulnerabilities always requires thinking outside of the box. Creative thinking can help determine the unexpected outcome and its implication to the system, subsystem, or application. Typical use cases would only test for normal behavior/ lapses.
- It's just not Safety anymore. Security should also be considered as part of the design. And understanding the scope of security and possible vulnerabilities would not incur an additional cost of security than the required scope.

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The start-up and OEMs are in jeopardy between reducing EV costs and spending money to boost infrastructure, while the government, on the other side, is incentivizing the use of EVs. But has this addressed the vital questions related to long-term sustenance?



Figure 3: Consideration as per ISO 26262 in a V model

- **No Silver Bullet.** As observed by Fred Brooks in 1986 in a widely discussed paper on software engineering. "There is no single development, in either technology or management techniques, which by itself promises one order of magnitude improvement within a decade in productivity, in reliability, in simplicity". There is no shortcut to a safe and secure product, and therefore rigor in the following process is of utmost significance. Safety and Security are processes and not a product.
- The Devil is in the Details. Mistakes are usually made in the smallest details of the project. A seemingly simple concept might be far more challenging to implement in a complex environment. It is extremely critical to understand the minutest details for developing an efficient and reliable system.
- **Test Early and Test Often.** A bug detected early within the SDLC can be addressed much faster and at a low cost. Having a test-based approach and inculcating testing while developing and testing as often would have increased software quality assurance and a reliable system, sub-system or application.
- Use of Qualified Tools. The key to successful validation is the need to make sure testing is accurate. In most cases, for regulated industries that enforce functional safety and security standards, incorrectly verified software would result in delayed certification and in some cases, even legal liabilities. It is always validation that enables getting a product certified right the first time.
- **Certification Framework.** Building the systems and sub-systems from a certification mindset from the

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Neglecting the software safety and security would pose severe liability issues when scaling OEM's production capacity for export markets.

design stage helps the manufacturers concentrate on the domestic market opportunities and export potential.

As part of the ecosystem for safety, security, and mission-critical product development, LDRA has been the pioneer and instrumental in many process standards and coding guidelines since 1975. LDRA assured world-class tools, and capabilities make us the preferred partner for the Automotive vertical. Boasting a worldwide presence, LDRA is headquartered in the United Kingdom with a presence in the United States, India and Germany coupled with an extensive distributor network.

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Roadblocks to broad consumer adoption of EVs in developing nations

⁄ TUSHAR BHAGAT

Uffizio India Pvt. Ltd.

lectric Vehicles are around the corner with the promise of lower travel costs and carbon emissions. So the rapid shift of the transport sector towards electric mobility shouldn't be surprising. Electrification of vehicles reduces dependency on oil and frees the vehicular exhaust from greenhouse gases. Not only are they a friend of the environment but also economically efficient. The concept of widespread EV adoption is deliberated globally-especially in developed countries. However, the conversations of EV adoption haven't found their way to developing or low-income countries. Especially in a time when escalating fuel prices and deteriorating environmental conditions continue heighten the need for EVs in such emergent nations. For instance, in India, poor-quality air is a life-threatening health issue. Out of the 30 most polluted cities in the world, 21 of them are in India. As a corrective measure, the government of India has aimed to power 25% of private vehicles electrically by 2023. Hence, one can see why it is imperative to discuss the long-term EV adoption plans for developing nations.

Problem with EVs in developing nations

The United States of America and China make up 65% of the total E4W users (Electric fourwheelers) in the world. Next in line is Europe with a global share of 23%. On the other hand, countries like India, Pakistan, Vietnam

contribute to a despondent 1%. Despite its acute need, EVs remain unpopular in developing countries. For which, the high cost of ownership, poor range, slow charging, and resistance to accepting new technologies can be held accountable. Hence, financial limitations, environmental conditions, and resistance to new technologies have had a debilitating effect on the use of EVs in emergent nations.

1. High COA (Cost of Acquisition)

For low-income families, E4W acquisition seems nearly impossible without government subsidies. The total cost of acquisition(COA) of E4Ws is about 10 times higher than the initial COA of gas-powered E4Ws. While electric scooters or E2W are economically accessible, the high-sticker price of E4Ws

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Mr. Tushar Bhagat is the CEO of Uffizio. He has simmered 15 years worth of informatics knowledge & experience into a one-of-a-kind telematics platform. This fleet management system has been acclaimed and widely used by businesses in over 60 countries. Mr. Bhagat firmly believes in finding creative solutions to everyday challenges—so businesses can bloom into their full potential. continues to hinder widespread EV adoption in emergent nations.

2. Poor driving ranges

The low energy density of E4W batteries plus non-existent charging infrastructure equal poor driving ranges. These lead to range anxiety where a driver constantly worries about how far they can travel with the remaining battery. Hence, it is clear why a limited driving range between consecutive charge times is a major obstacle to broad consumer adoption. It hurts productivity and prevents the use of EVs beyond city limits.

3. Long charge times

At 1.4 kW, it takes an average of three to eight hours to charge an E4W to 100%. When compared to an ICE car (internal combustion engine), which takes about 10 minutes to refuel—EVs certainly have long charging times. Hence, EV charging times become problematic when accomplishing timesensitive deliveries.

4. Resistance to new technologies

With a low literacy rate, the readiness of people to accept EVs as their primary mode of transport is certainly less. A study conducted

in Vietnam successfully concluded that consumers will pay more for better vehicular range and speed—unbothered by the vehicle's effect on the environment.

5. Temperature and EV ranges

Data obtained from 4,200 connected EVs and 5.2 million trips show that there is a significant effect of temperature on EV's state of charge (SOC) and range. At -15, EVs may drop up to 54% of their ideal range. However, even an increasing temperature isn't exactly helpful either. After 22°C, increasing temperatures cause a steep drop in EV range, as seen below:

Brainstorming solutions to increase EV outreach

To maximize consumer convenience in developing countries, a lot can be done. The lack of infrastructure, traffic congestions, and slow charging times affect EV ranges. A way to combat range anxiety is efficient routing. Route optimization is a major aspect of EV management. It includes designing routes that can maximize EV autonomy. The objective here is to plan routes that give access to charging infrastructure without increasing the total distance of the trip. Switching to E2Ws can also help reduce some of that range anxiety. While E4Ws require sophisticated charging infrastructures, E2Ws can function just fine with portable batteries or charging from an outlet.

Getting accurate, real-time information about an EV's state of charge, battery life stats, alerts for critical range, projected EV mileage, trip distance, and more can greatly reduce range anxiety. A powerful EV management software may help improve the performance of EVs in developing nations—without being a burden on the cost of EV operation.

Adapting EVs in emergent nations is certainly a challenge—yet it is a challenge worth undertaking. EV use could considerably improve air quality indexes and reduce a nation's dependency on non-renewable sources of energy. Granted that the cost of an EV acquisition is high, but it certainly makes up for it by being energy efficient and environmentally viable.

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Industry Insight

Planning to buy a pre-owned or new Electric Luxury car? Here is what one need to know

A SUMIT GARG

Luxury Ride

lectric cars are the new consumer demand that is on rise both in the new and used car market. Even the pre-owned car segment is under the unwavering influence of electric car revolution. One of the reasons can be the fuel crisis and we believe that this year India will be ready for electric mobility spearheaded by the luxury giants. Likewise, this will contribute to the awareness around EV technology.

According to the estimations, the Global Electric Vehicle Market size is expected to grow at the rate of 26.8% CAGR, which will reach 34,756 thousand units by 2030 from 4,093 thousand units in 2021.

Advancements in EV Technology

It is the battery technology in EVs that accounts for the vehicle safety and efficient working. The innovation has come a long way ahead with the invention of lithium-ion in 1980s and has been an instrumental factor in giving surge to EV manufacturing. Also, consumers saw an increase in:

- Travel range
- Charge capacity
- Safety ratings
- Efficiency
- Performance
- Aesthetics
- Affordability

The revolutions in the silicon technologies with the coming in of new materials like silicon carbide, have been instrumental in optimizing the EV efficiency and power utilization. Additionally, advanced technologies like highvoltage current protection, signal isolation, and battery management technologies are continuously enhancing the EV performance. But there are a few questions that a person has to think about and inspect more while planning to buy a used electric vehicle.

Convenience of Electric Vehicles

Prior to buying a used electric car, one must be thoroughly convinced about the convenience of the vehicle. The biggest issue to be considered while buying an electric car is the availability and the ability of charging the vehicle. Considering that the installation of charging station is still in progress, one without any access to electric socket might face the difficulty of charging their pre-owned electric vehicle.

Moreover, one needs to consider the various charging options depending on the type of car they possess. Although a 3-pin plug is a standard type for charging the EVs, it is the slowest method.

Checklist for buying a used electric car (EV)

Before being mesmerized with the car model, it is important to thoroughly scrutinize the battery life of the car. It proves to be imperative in saving the unwanted expenses of battery replacement. One should go for battery lease plan of the car, in order to avoid issues arising from the battery.

To counter battery issues, nowadays used EVs come with battery warranty that lasts longer than the used car warranty. Earlier, various car models offered 8-year warranty, but recently some brands have cut down the warranty period to 5 years. This warranty period will be an added advantage for the buyer and the car.

List of pros serving as a guide for making the right decision:

Good Condition: The good condition can be determined by less mileage number.

Warranties lasting longer: This is one of the best aspects of owning a used luxury car. Some luxury cars offer warranties that last longer than 5 years. For best warranties along with quality services, one should always purchase from certified pre-owned luxury car dealer, for instance Luxury Ride.

Selecting from the best collection: Though one can purchase pre-owned cars from anywhere, it is better to buy from a certified pre-owned luxury car dealer to ensure the credibility. One can directly connect with the dealer.

- Latest technology: The latest vehicles are equipped with highly efficient modern amenities. Moreover, pre-owned cars may also have additional accessories like wireless networks, TV screen, smartphone integration, etc.
- Low Maintenance: Nowadays, smart cars are supported with complimentary maintenance services. It exempts the owner from spending any extra penny for issues arising during the warranty period.

Electric vehicles are powerful, affordable, safer, and reliable in the industry as it is the Future of Auto Market. Almost every automobile manufacturer is harnessing EV technology, whereas, other industries are continually striving to incorporate science for enhanced products. This will be beneficial for the preowned luxury car market as well.

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Sumit Garg is the MD and Co- Founder of Luxury Ride, a final shopping destination for the foremost exclusive and fascinating pre-owned luxury cars. At Luxury Ride, Sumit oversees various departments and his prime focus is exponential expansion of Luxury Ride across India. He is also highly involved in the day-to-day functioning of the company in order to get the DNA right which can support the exponential business growth and create a strong foundation.

CAVLI WIRELESS C10GS IOT CELLULAR MODULE REVIEW The cutting edge upgrade to the connected car systems

Description

The Cavli Wireless C10GS CAT1/4 is a cellular IoT module is the hardware module that enables various applications and utilities of the connected car. The C10GS, which is an LTE CAT compatible Smart Cellular Module based on 3GPP Release 10. C10GS uses a Dual Core ARM11 processor with a 400 MHz frequency and enables direct execution of JAVA bytecodes and SIMD DSP instructions. This processor is the heart and soul of C10GS. The integrated GNSS & eSIM, coupled with the Cavli Hubble Global Connectivity platform, ensures the module can be deployed globally, making it an ideal solution for logistics, automotive, vehicle tracking systems, and more.

By default, C10GS provides LTE CAT 1 connectivity which typically provides you with 10 MHz bandwidth and 10 Mb/s peak data rate in addition to 5 and 10 Mbps uplink and downlink speed, respectively. Cavli also provides an upgrade from LTE CAT1 to CAT 4, depending on the requirements. CAT 1 offers affordable and cost-effective solutions, while CAT 4 enables more power

and performance for high-end applications. Primary services allowed for users in a connected car include entertainment, information regarding fuel efficiency, navigation and tracking, maintenance, safety, etc.

Overall

The connected car utilizes the best features of IoT in catering the best application services to each user. For commercial vehicles, trip history, fatigue calculation, vehicle condition, and performance as well. With the prediction of reaching \$225.16 billion by 2027, the Connected Car market is growing exponentially. It has the potential even to cross the current forecast too. With new technologies like 5G, IoT, Smart devices, etc., manufacturers can provide consumers with better features and riding experiences. Connected cars, when incorporated with the latest technology, can be safer and eco-friendly. With touch-based consumer experience getting wider acceptance, users will control the system from their fingertips.

Benefits

- The integrated GNSS & eSIM, coupled with the Cavli Hubble Global Connectivity platform, ensures the module can be deployed globally, making it an ideal solution for logistics, automotive, vehicle tracking systems, and more.
- The LTE baseband chip used for connectivity is from GCT, which provides improved connectivity with minimal interruptions. ARM11 architecture uses four MP11 CPUs with one Snoop Control Unit (SCU).

• The processor is a highperformance, low-power, cached multiprocessor that comes with

full virtual memory capabilities. This processor is ideal for high-performance applications along with the LINUX kernel for controlling the hardware.

- LTE CAT 4 provides double the bandwidth and ten times the speed compared to CAT 1. This will ensure fast connectivity for various applications. They both use the same existing network, and there won't be any extra cost to the network operator or the company.
- C10GS comes with 128 MB each for RAM and Flash memory, of which 14 MB and 66 MB respectively for any user applications.
- All types of user applications can be designed and developed using the OpenSDK platform.
- Some essential features include crash detection and roadside assistance, vehicle health diagnostics, theft-proof and alert systems.

Features

- High-Performance Architecture
- Two-in-one Module- CAT1 and CAT4
- Worldwide connectivity- GNSS, namely GPS, Beidou, IRNSS, Galileo, GLONASS
- 128 MB each for RAM and Flash memory
 All types of user applications- OpenSDK platform.
- FOTA Firmware Over The Air Updates
- Inbuilt Crash recovery
- Open for future upgrades like 5G

Verdict

The IoT market is making strides in every field. Automotive companies cannot ignore the growing consumer demand for smart technologies and automation. How far will Automotive OEM manufacturers be prepared to grasp the shifts within the industry? Are the manufacturers prepared to upgrade to the unrivaled IoT package offered by the Cavil Wireless- C10GS?

EV CHARGING INFRA - Market scope and Future Direction with B2B segment

A MAYANK JAIN E-Fill Electric

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V penetration is skyrocketing in western and European countries by the passing time, India is also gearing up in the EV market but still, we are lacking to catch up with the pace of other developed countries in EV adoption. Despite having many provoking reasons for customers to adopt electric mobility many barriers come along with it which are decelerating the EV adoption. Barriers like large population, low public infrastructure, less awareness and myths, and heterogeneous development in urban areas contribute the most in slowing down EV adoption.

The EV charging market in India is mainly captured by the charging stations and power supply organizations that supply the power to charge electric and hybrid electric vehicles.

As the passing time, the technology is overpowering all industries also in the global Electric vehicle industry the technological approach gave the best results for upscaling the electric vehicle industry. Following the same the stations can cater to all the standard requirements like (Smart Plug, Bharat AC001, DC001 (GB/T), CHAdeMO, and CCS2) to EV users on a common board.)

Right now, in India, the majority of charging station services are either provided by private companies like us (E-Fill Electric) or by government bodies. But as per the upcoming forecasted demand of electric vehicles and it is charging infrastructure these inputs won't be sufficient to cater to the demands of electric vehicle owners/users and we need one another hand to make India's EV charging infrastructure purely user friendly. Another hand is of community EV charging providers.

As charging an electric vehicle requires at least 1-2 hours of nonstop charging and therefore more no. of charging stations will be required to cater to the demand especially at community places like Hotels, resorts, business places, and many other places. To fill this gap the community site owners, need to actively participate and contribute to making the Indian electric vehicle industry stronger.

Responding to the proactive approach of the policymakers, the electric mobility market has witnessed strategic partnerships between the various players of the EV

	Individual charger owners	Shared charger users	Corporate users	Public charger users
Charging locations	Individual house	Collective building	Corporate	Public
Parking lots	Private	Shared or public	Shared	Public
Customer charging nabits	Overnight slow charge	Overnight slow charge	Slow charge during the day Overnight slow charge Fast charge for punctual use	Slow charge during the day Overnight slow charge Fast charge for punctual use
Mobility use-cases	Professional use of car for long - & short - distance trips Commuting to work Leisure mobility, holidays, shopping/groceries,	Professional use of car for long- distance trips Commuting to work Leisure mobility, holidays, purchase	Use of car for sales trips Use of car for delivery	Leisure mobility for holidays (short & long trips) Professional use of car for long-distance trips Functional use, puncutal trips

Market segmentation based on customer's charging locations and habits

supply chain. This has been done with dual objectives of diversifying product portfolio and reducing operational risks thereby increasing the readiness of the industry to respond to the electric mobility disruption.

Market Potential based on Charging usage

We at E-Fill have explored synergies with all possible categories of B2B clients where we have installed all kinds of chargers for private & public for a particular use case & application. As the EV market grows with the expected CAGR, more companies on EV Fleets, Cooperates, Mall & societies will also start getting EV ready as per govt ongoing & upcoming mandates to support Green & clean ecosystem, will start entering in this and would require a complete EV Ecosystem which E-Fill has already built & perfect over time.

Rebuilding the customer's habit and flow of using mobility will be a major challenge to construct a fail-proof EV eco-system. And as EVs are inevitable customers are going to see a radical change. Driven by a decrease in total cost of ownership (TCO) and the emergence of autonomous cars, the mobility revolution is at our doorstep, waiting to become part of our daily lives. The shared autonomous electric vehicles are no more alien words to anyone. Thus, it's very important to understand how customers will embed this new mobility mode into their life. Because the growth of any industry is depending upon the response of their customers and especially the growth of the EV industry is highly dependent upon the mobility user's response we identified and divided the whole charging station scenario into four options depending upon the various mobility use cases(as shown in the table).

The future

Now talking about the future of electric mobility, it'll highly depend upon these 3 factors i.e., technology, government regulations, and customer experience. Let decode all the 3 factors in detail:

Technology: Tech. acts as a building pillar for any organization/sector to scale up and none the less in the EV ecosystem - like charging stations, electric mobility advancement and sustainable energy

sources to power electric vehicles.

Government incentives and regulation: As seen from the case study of a few countries which are many years ahead of India in terms of EV penetration it's observed that government incentives and regulation contributed a lot to EV adoption in that country.

Also, we can see the rise in EV adoption in India right after the rollout of the fame-II subsidy started. Without government incentives, both businesses and customers won't show any interest in adopting electric vehicles.

Customer experience: "Customer is the king" this famous quote has a specialty

that fits in all types of business and markets. Similarly, for the EV industry, these analyses give a brief of the success rate of implementing any new strategy or technology in the EV industry.

The revolution in the auto industry comes with many challenges and one of the most profound ones of them is changing the habit. There is no other way and customers have to change their ongoing mobility to adopt electric mobility.

We at E-Fill Electric as an Ecosystem provider Working with real-estate, builder, parking solution companies, mall, Cab fleets believe the future of the EV is more realistic & promising.

AUTHOR

MAYANK JAIN Founder & CEO

E-Fill Electric

Mayank Jain, the founder & CEO of a young technology driven start-up began his journey of Entrepreneurship after working for more than 8 years in automobile R&Ds. Mayank is a passionate innovator turned Entrepreneur with having filed 6 Patents, one design application and few research papers.

Fleet telematics playing an important role to facilitate EV adoption in India

🚈 ABHIJIT SENGUPTA

HERE Technologies

ndia's transportation & logistics sector is currently in the midst of a shift with the rise of connected and automated vehicles reshaping the industry. In line with broader sustainability commitments, fleet electrification also has a critical role to play in this transition.

The industry's electrification efforts can be traced back to 2015 when the government launched a three-year scheme - Faster Adoption and Manufacturing of Electric Vehicles (FAME-I). The scheme was designed to create demand, roll out pilot projects, build technology platforms and charging infrastructure. This was propelled with a more recent launch of FAME-II, to further incentivize commercial vehicle buyers who decide to switch over to cleaner and more sustainable transportation.

Players in the transportation & logistics industry naturally embraced the opportunity. Driven by the promise of

carbon reduction targets, reduced business costs and customer demand for eco-friendly solutions, some of the largest e-commerce brands, ride-hailing services and fleet management companies have already announced substantial investments to pivot to EV usage for their fleet operations.

As an example, one of the largest global e-commerce companies recently rolled-out electrification of its last-mile delivery fleet to reduce dependence on non-renewable resources. In another instance, a ride-hailing operator in India confirmed the deployment of over 1000 EVs in the coming months.

Despite the initial promise, slow update in fleet electrification

Despite an increasing interest in fleet electrification, the uptake of electric commercial vehicles is slower than anticipated. This can be attributed to multiple factors including high costs of ownership, lack of charging infrastructure, dynamic regulatory environment and poor information around vehicle characteristics (e.g., life duration, model variety, charging time, battery range, etc.).

Given these challenges, any organization's transition to EVs will depend on how effectively it can monitor and manage these vehicles, and this is where the latest innovations around vehicle technologies can play a critical role.

Telematics can assist in the first assessment of compatibility to help organizations in their development and implementation of a successful EV strategy while also allowing them to work with existing infrastructure.

Telematics: a possible solution to overcome barriers in fleet electrification

Telematics at its core makes use of Geographic Positioning System (GPS), on-board sensors, and real-time diagnostic tools to visualize a vehicle's movement on a map.

With telematics, fleet management companies can bring in real-time insights into their operations, thus enabling effective route management, benchmarking vehicle utilization, monitoring driver behaviours throughout the first-middlelast mile deliveries. This ultimately brings in operational efficiencies and thereby transforms fleet operations.

We have outlined a few ways how we think telematics can enable the electrification of businesses' fleet through telematics.

Integrating EVs into the existing fleet

Telematics solutions embedded with sensors and engine diagnostics in existing internal combustion engine (ICE) vehicles, can provide real-time insights on vehicle routes. This can include information on delays, traffic conditions, accident-prone areas and vehicle performance indicators such as mileage, aggressive acceleration, etc.

These insights can help evaluate whether EVs can complete these journeys in a single charge. The data can then be used to identify which current ICE vehicles can be replaced by electric fleets. The mileage data collected can help calculate potential fuel savings the company can expect by bringing in more EVs.

EV-specific vehicle telemetry could thus help companies make informed decisions about whether electrification will lower costs and help meet carbon-emission targets.

Managing charging infrastructure and priorities

The lack of charging infrastructure is one of the main reasons behind the slower pace of e-mobility adoption in the commercial vehicle segment. With telematics inbuilt with location-enriched APIs and geocoded solutions, fleet managers can layer the incoming information on enterprise-grade maps and help drivers identify available public charging points.

Fleet telemetry uses plug-and-play devices to collect multiple data feeds in real-time and generate in-vehicle alerts with accurate calculations of the true range left in vehicle batteries. With this data, fleet operators can ensure fewer vehicle breakdowns and better utilization of EVs in their fleets. They can also anticipate flat batteries and if an alternative vehicle needs to be dispatched.

Reshaping road safety and model driving behaviours

As companies evolve to EVs, telematics will play a significant role in reshaping road safety and model ideal driving habits. Although EVs are very similar to conventional vehicles in their make-up, they require a significant change in driving behaviour.

Telematics can help identify risky driving behaviors, spot areas for improvement and empower drivers to adopt secure, safe, and eco-driving techniques. For example, fleet managers can analyse the data incoming from a driver's phone to understand acceleration and braking patterns e.g., on the highway or at an intersection. This data provides a realistic picture of drivers' decisions and also helps understand the impact on battery usage or on vehicle parts wearing down quickly.

Future-proofing business against regulatory uncertainty

Cities worldwide are aiming for vehiclefree transportation to reduce air pollution and improve the safety of their citizens as climate change and environmental concerns continue to grow. For example, the Delhi Government has made it illegal to drive 15-year-old petrol and 10-year-old diesel automobiles in the Delhi National Capital Region (NCR). More cities are anticipated to follow this trend.

In this case, telematics can help fleet managers identify which ICE vehicles in their fleet are approaching future exclusion zones and replace them with EVs without disrupting business operations.

Exciting greener times ahead

There's never been a better time for fleet electrification than now, with an increase in the number of EVs in the market, in addition to increased government support, decreasing costs of technology and increased consumer inclination for all things eco-friendly. If transportation and logistics providers want to stay relevant and competitive, they must reassess their goals as the need for a more sustainable and greener world grows louder.

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Continental cabin sensing: Interior sensors for sophisticated design and enhanced safety

Continental has developed an integrated solution for interior sensor technology which already meets future safety standards and further increases vehicle comfort. In the cabin sensing solution, the technology company combines many years of expertise on all aspects of interior cameras for human-machine interaction with extensive know-how in radar sensor technology. With real-time object monitoring of the entire vehicle interior, Continental is going beyond purely driver monitoring and offering an additional building block for future mobility models, such as automated or autonomous driving. The technology meets future safety regulations of the European Commission and the consumer protection organization European New Car Assessment Program.

The complexity of the technology lies firstly in integrating the optics and sensor systems, minimized to around 10 millimeters, precisely and

Verizon, Nissan, CCTA collaborate on connected-vehicle technology for roadway safety

Verizon and Nissan North America's Research and Advanced Engineering team have completed a research proofof-concept demonstrating how sensor data from vehicles and surrounding infrastructure can be processed at the edge of Verizon's wireless network and communicated back to vehicles for urgent driver notifications in near real-time. The test successfully applied that process — an example of cellular vehicle-to-everything communication (C-V2X) — to scenarios in which drivers may find it difficult to see vulnerable pedestrians or oncoming traffic emerging from behind visual obstructions. The Contra Costa Transportation Authority (CCTA) will initiate validation of the technology for its Automated Driving Systems Grant Program, which would see the use case tested in controlled public environments in Contra Costa County toward potential live deployment upon validation.

entirely into the display to the highest standards of aesthetics and appearance. Secondly, there is the precise positioning of the radar sensor, which has to cover all the areas of the interior equally. The combination of the two technologies and the exact integration and positioning make it possible to develop different applications for cabin sensing.

Geotab and General Motors deliver real-time invehicle driver coaching for safer roads

Underpinning its continued commitment to increase driver safety, Geotab announced that it has been working with General Motors (GM) Fleet and OnStar Business Solutions to provide an in-vehicle coaching service via the Geotab Integrated Solution for GM. Unlike other in-vehicle driver safety alerts that beep, buzz or light up, this new safety service delivers real-time spoken alerts to help keep drivers' eyes on the road, promoting good driving habits and helping achieve improved fleet safety.

The Driver Feedback (In-Vehicle Coaching) service is now included in the Geotab Integrated Solution for GM. The newly released Driver Feedback service is designed to trigger events via audible alerts delivered through the vehicle infotainment system when certain driving conditions are met. It provides insights into specific driving behaviors to help create awareness and encourage safe driving habits by coaching drivers in real-time.

Upstream Security lands investment from BMW i Ventures to accelerate the development of connected vehicle cybersecurity solutions

Upstream Security announced the close of a Series C round which includes BMW i Ventures as a new investor.

The partnership between Upstream and BMW provides a business and technology platform to collaborate on projects that improve and enhance the utilization of data analytics and technologies available for the connected vehicles industry. The collaboration with Upstream started back in 2019 when Upstream joined the BMW Startup Garage program and became a supplier of the BMW Group. The pilot project was successfully completed by the BMW Technology Office in Israel. Leveraging the BMW Startup Garage program, Upstream can harness experienced and specialized resources to develop and test its technology.

Pioneer Power launches E-Boost© – smart, mobile EV charging solutions

Pioneer Power Solutions, Inc. announced the launch of its E-Boost© portfolio of mobile Electric Vehicle charging solutions for a full range of applications. The company's E-Boost portfolio is initially comprised of three products.

E-Boost G.O.A.T. (Generator on a Truck) is a truck-mounted option that brings ultimate mobility with high-capacity EV charging. It enables ondemand charging of EV vehicles at any convenient location, providing EV truck and car owners the convenience of dispatchable charging services and thereby eliminating 'range anxiety.'

E-Boost Mobile is a trailer-mounted solution that balances the need for mobility and higher capacity of EV charging such that the solution can be relocated with minimal effort on short notice. E-Boost Mobile provides multiple options for towing and can be available at specific businesses, large sports and cultural events or other gatherings to fulfill the elevated demand for high-speed charging.

E-Boost Pod is a stationary EV charging solution with customizable higher capacity and can be moved, if necessary. The Pod can provide highspeed DC Fast Charging (DCFC) to two vehicles simultaneously.

Volvo Group launches vehicle using fossil-free steel

Volvo Group is proud to reveal vehicles made of fossil-free steel from SSAB. During the green steel collaboration event, it was announced that more vehicles will follow in 2022 in what will be a series of concept vehicles and components using fossil-free steel from SSAB.

The machine, a load carrier for use in mining and quarrying, was unveiled at a green steel collaboration event in Gothenburg hosted by Martin Lundstedt, President and CEO, Volvo Group.

With a commitment to be climate-neutral and achieve net-zero value chain greenhouse gas emissions by 2040, Volvo Group is on the path towards developing sustainable transport and infrastructure solutions for the future. Along with the electrification of its vehicles and machines,

Volvo is determined to reduce the carbon footprint of its entire supply chain, and this latest innovation is one step forward on this path.

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Israel to get 'Foldable' Electric Car CT-1 from City Transformer as emergency response vehicles

City Transformer, based in Israel's Tel Aviv that has developed the CT-1, the foldable electric car, has made a deal with United Hatzalah based in Israel's Jerusalem. This deal is likely to make the volunteer-based emergency medical services organisation a major client of City Transformer, founded in 2014.

City Transformer has developed the CT-1 electric car. It is a 2.49-meter long and 1.4-meter wide vehicle. The car operates on a patent-registered folding mechanism due to which the wheelbase can be contracted down to just one meter. This can help the driver of the car

in easy parking and maneuvering through traffic,

The vehicle has a seat for a driver and another adult, sitting in tandem. Another interesting aspect is that the cabin of the car does change its shape even as the wheelbase narrows due to contraction. The vehicle has different maximum speeds in its narrow and wide modes. It can run up to 45 kilometers an hour and 90 kph in its narrow mode and wide mode, respectively. It can go 100-150 kilometers after being charged fully for one time.

HEADLINES

- CTEK launches a revolutionary new battery charger and maintainer, with APTO technology
- Ford Pro Readies American Businesses; All-electric E-Transit customer pilot vehicles debut nationwide
- Sensata announces new electrification solutions for megawatt charging of heavyduty electric vehicles
- ADS-TEC Energy GmbH signs-onto COP26 joint declaration on the transition to zero-emission vehicles
- Atlis Motor Vehicles forms strategic partnership to recycle lithium-ion batteries
- Gogoro launches battery swapping in China
- Momentum Dynamics and Solano Transportation Authority build interagency wireless bus charger network in Northern California
- Thailand positioned to be a global electric vehicle hub
- Toyota charges into electrified future in the U.S. with 10-year, \$3.4 billion investment
- MIXTE direct-to-consumer light electric vehicle company launches in the U.S.
- StoreDot to establish a global innovation hub in the US to speed up the development of solid-state batteries

ZF invests in Oxbotica to deploy autonomous passenger shuttles in major cities

ZF is systematically expanding its expertise in the future field of autonomous driving in line with ZF's "Next Generation Mobility" strategy. To this end, ZF has signed a strategic partnership agreement with Oxbotica to develop a Level 4 self-driving system that will initially be deployed in passenger shuttles in major cities around the world.

ZF and Oxbotica will develop a Level 4 self-driving system that can be integrated into various vehicles including Mobility-as-a-Service (MaaS) shuttles to provide on-demand passenger and also goods transportation vehicles in urban environments.

The two companies share a joint vision for the future of mobility and the transformational potential that autonomous technology can have across multiple industries where people and goods move. The autonomous shuttle market will grow substantially over the next ten years with the potential to increase access to mobility, improve road safety, reduce congestion, and boost productivity.

HEADLINES

- Perrone Robotics selects Ouster as a preferred lidar supplier to scale autonomous vehicle deployments
- Ambarella to acquire Oculii; radar perception AI algorithm global leader
- MediaTek selected to power Vewd for Automotive platform
- Tata Motors and BluSmart Mobility partner to expand the all-electric fleet in Delhi-NCR
- Ford and Newlab announce startups to pilot new EV tech in mobility innovation program
- UGI Selects IntelliShift for vehicle AI Video deployment
- NightDragon, Ingram Micro form strategic alliance to accelerate emerging technology go-to-market success
- UAEU and Ericsson sign MoU at GITEX GLOBAL to develop and test 5G autonomous driving use cases
- Ansys selected by Panasonic Automotive to streamline functional safety analysis for future mobility technology
- Goodyear and SARTA collaborate to advance intelligent tire technology and sustainable mobility
- Autoliv and the Piaggio Group join forces to develop a scooter and motorcycle airbag
- Traffilog joins forces with SafeRide Technologies to lead the automotive data revolution
- eSync[™] Alliance and Autoware Foundation join forces to accelerate autonomous vehicle software deployment
- Innoviz perception solution supported on NVIDIA DRIVE platform
- University of Massachusetts expands ParkMobile partnership to the Lowell campus to offer contactless parking solutions
- Torc Robotics collaborates with Applied Intuition to accelerate the development and validation of autonomous trucks
- Daimler Mobility and Visa form global technology partnership to integrate digital commerce into the car seamlessly and conveniently
- NXP and Ford collaborate to deliver next-generation connected car experiences and expanded services
- ParkMobile announces partnership with the City of Leavenworth, Washington, to offer contactless parking payments
- ZF and DB Regio agree on strategic partnership for autonomous transport systems
- ChargePoint leads charge across Europe with strategic acquisitions, pioneering R&D facilities, and growing team
- BlackBerry, Google and Qualcomm join forces to drive advancements in nextgeneration automotive cockpits
- Bridgestone and HERE collaborate to shape a sustainable future for mobility
- Yunex Traffic and HERE expand partnership to create proactive traffic management solutions
- ParkMobile partners with Portland State University to provide contactless parking payments on campus
- DENSO invests in Dellfer to help bring automotive cybersecurity software to market
- Radius acquires Global Go!

Daimler Trucks North America and Platform Science introduce Virtual Vehicle

Daimler Trucks North America (DTNA), in collaboration with Platform Science, announced the launch of Virtual Vehicle[™], the open OEM platform that enables fleets to access telematics, software solutions, real-time vehicle data, and third-party applications directly from their vehicles. In addition, the platform provides the tools to manage those applications, connectivity, and the mobile devices drivers need to use them. Virtual Vehicle represents a platformfirst approach that provides customers greater value and a significantly expanded choice of software-enabled services.

The Virtual Vehicle platform offers many benefits to fleets, including:

- PRODUCTIVITY: With factoryinstalled telematics hardware, fleets can maximize uptime by avoiding installation delays and costs for complementary hardware.
- FLEXIBILITY: Virtual Vehicle allows fleets to create a software experience catered to individual business needs through a growing pipeline of developercreated innovations.
- ACCESSIBILITY: Virtual Vehicle leverages edge, cloud and in-dash data to optimize networks, keeping data available 24/7/365, even when fleets are offline.
- COST-EFFECTIVE: Users of participating applications on Virtual Vehicle benefit from usage-based billingoperation, certification, and reporting.

Amazon self-driving cars headed to Seattle

Amazon's self-driving cars are coming to Seattle, Washington, in an expansion of the trials already underway in San Francisco and Las Vegas. Amazon's Zoox unit plans to deploy a fleet of Toyota Highlanders with sensor technology and autonomous driving software.

The cars will be operating at level-3 autonomy, with the car able to navigate point-to-point trips in conditions, but with a human operator backup, typical in most autonomous vehicle (AV) trials.

The plan is to add road knowledge in the more temperate weather conditions in the Northwest into the Zoox artificial intelligence (AI) software. The highway laws in Seattle differ from those in Las Vegas and San Francisco, with the top speed in Seattle set at 25 compared to 30 mph in the other cities.

Autoliv uses HERE to analyze driving behaviour

HERE Technologies announced that Autoliv is using HERE Speed Limits, Fleet Telematics, and Weather APIs for its Connected Safety Services.

With Autoliv Driver Safety Score software, real-time data from the driver's smartphone is used to analyze driving styles and recommend improvements in four key areas: speed, focus, smoothness, and turns. Autoliv Driver Safety Score software can be used by fleet managers and insurance companies to offer lower premiums through reductions in risky driving behavior.

HERE map data and location services help add context – weather, road regulations, traffic congestion – to the information collected from phone and vehicle sensors, making Autoliv's recommendations comprehensive and truly personal. Autoliv is integrating HERE map data and services, with the ability to include further attributes in its analysis such as road curve radius, slope, height, traffic signage, lane count, physical dividers, and road roughness.

GreenPower Motor Company announces OEM agreement with autonomous vehicle technology provider Perrone Robotics

GreenPower Motor Company Inc. together with Perrone Robotics announced their Original Equipment Manufacturer (OEM) agreement. Under this new agreement, the two companies will continue to build on the success of the original AV Star developed for the Jacksonville Transportation Authority (JTA) in 2019. The original AV Star was developed to meet a growing demand in the transit and transportation sector where reliable mobility was a requirement to expand accessibility options for all end-users. Once deployed in 2019, the JTA AV Star became the nation's first fully autonomous, all electric, ADA-compliant, and FMVSS certified vehicle. The base EV Star vehicle is also Altoona tested and Buy America compliant.

Motional and Lyft to launch fully driverless ride-hail service in Las Vegas in 2023

Motional and Lyft, Inc. announced the planned launch of a fully driverless public ride-hail service in Las Vegas. Motional's next-generation robotaxis, the all-electric Hyundai IONIQ 5-based robotaxi, will be available on the Lyft app in Las Vegas, starting in 2023. The deployment is part of a landmark partnership between Motional and Lyft announced last year.

The service will be the first time fully driverless cars for use in a ride-hailing service are available to the public in Nevada. Launched by Aptiv in 2018 and now as Motional, the company has operated a public self-driving service with Lyft in Las Vegas for over three years. The 2023 deployment represents a significant expansion, will use Motional's next-generation robotaxi, and will be the first time passengers experience a fully driverless Lyft and Motional ride. With plans to launch in multiple markets, the service is also designed to be scalable and positions both Motional and Lyft to introduce millions of riders to driverless technology in the future.

Autonomous Vehicles, Connected Vehicles, and Their Impact on Payments

Mercator Advisory Group's most recent report, Autonomous Vehicles, Connected Vehicles, and Their Impact on Payments, finds that autonomous vehicles (AVs) is a quickly evolving category with pilot programs, small scale deployments, and implementations happening across the U.S. and the globe. Covid-19 has led to new areas of focus and implementation, speeding up and expanding trial and usage of contactless purchases, payments, and deliveries. The pandemic increased consumer need for, exposure to, and acceptance of contactless delivery and the use of autonomous delivery robots and vehicles.

While much of the AV publicity is related to fully automated self-driving cars moving people in cities, the reality is that the most advanced trials and implementations are happening in the areas of moving packages and food rather than people (zero-occupant) and moving along predefined paths rather than flexible routes. Walmart has been testing self-driving truck and drone deliveries. Amazon has been making deliveries with its autonomous robot, Scout. Uber recently spun out the Postmates X robotics unit under the name Serve Robotics, which has been making deliveries in Southern California. Autonomous vehicles will have a major impact on the payments ecosystem.

India Electric Vehicle Market Report 2021: Market is expected to reach \$152.21 Billion by 2030, growing at a CAGR of 94.4% – ResearchAndMarkets.com

The "India Electric Vehicle Market Size, Share & Trends Analysis Report By Product (BEV, PHEV), By Vehicle Type (Passenger Cars, Commercial Vehicles), and Segment Forecasts, 2021-2030" report has been added to ResearchAndMarkets.com's offering.

Auto dealers look to increase security measures amid rising cyberthreats

With rising concerns of ransomware and phishing attacks impacting businesses across the U.S., nearly half of automotive dealers surveyed plan to increase their investments in cybersecurity in 2022, compared to only 24% of dealers that invested in security measures in 2020, according to a study by CDK Global, Inc., a leading automotive retail technology company.

IT-related business interruptions can be costly errors for dealerships, impacting businesses an average of 16 days in lost revenue if targeted by a cyberattack. Recovering from a data breach and restoring a dealer's reputation is both costly and time-intensive, and automotive retailers may fall prone to meeting cybercriminals' demands to keep their dealerships running. In fact, recent data by ransomware specialty company Coveware shows that payouts by businesses nearly quadrupled from 2019 to 2020, jumping from nearly \$44,000 to \$169,000. CDK's cybersecurity report highlights the need for dealerships to put necessary preventative measures in place to stem future incidents:

- While dealerships recognize there is an increased sense of urgency to prioritize cybersecurity relative to other operational areas (85%), only 49% believe they currently have adequate protection against cyberattacks.
- Employee email phishing remains the biggest perceived threat to dealer businesses (66%), but less than a third of employees have received formal security training on how to avoid it. Additional concerns include ransomware (48%) and malware (30%).
- A total of 65% of dealerships are regularly backing up data, system images and configurations and keeping the backups offline, but 73% are not testing their cyberattack incident response plan.

Investing in modernizing aging security products, educating employees on increasingly sophisticated and frequent threats, and solidifying disaster recovery plans before an incident occurs can uphold a dealership's reputation in the marketplace," said Bell. "If an automotive retailer's cybersecurity plan for prevention, protection and response is firmly in place, dealerships can focus on strengthening the consumer buying experience while building trust.

HEADLINES

- The installed base of fleet management systems in the Americas to reach 31 million units by 2025
- Embedded car OEM telematics subscribers reached 133 million in 2020
- North America Electric Bus Market size to surpass US\$ 850 Mn by 2027
- The installed base of connected tanks to reach 22.2 million in 2025
- Guidehouse Insights anticipates the electric vehicle charging infrastructure market to exceed \$207 billion by 2030

India's electric vehicle market size is expected to reach USD 152.21 billion by 2030 and is expected to expand at a CAGR of 94.4% from 2021 to 2030.

The stringent regulations being drafted by the Indian government in response to the rising levels of vehicular emissions and the growing demand for environmentfriendly vehicles are expected to drive the growth of the market over the forecast period. The efforts being pursued by the government to develop sustainable charging infrastructure in India also bodes well for the growth of the market.

Although the electric vehicle market in India is in its nascent stages at present, it is poised to emerge as one of the leading electric vehicle markets in the world. The Indian government has been pursuing consistent and committed efforts and has already drafted dedicated EV policies and rolled out various demand and supply incentives as part of the efforts to encourage the adoption of e-mobility across various market segments.

For instance, India's Department of Heavy Industry (DHI), under the National Electric Mobility Mission Plan (NEMMP) 2020, has formulated the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme to support the development of both Hybrid Vehicles (HV) and Electric Vehicle (EV) markets as well as that of their manufacturing eco-systems.

HERE launches Intelligent Speed Assistance map for automakers to comply with EU regulation

HERE Technologies announced the launch of the HERE ISA Map, delivering vehicle systems and drivers fresh and accurate speed limit information on any road. The HERE ISA Map was designed for automakers to comply with requirements under the European Union's (EU) new Intelligent Speed Assistance (ISA) regulation aimed at road safety and reducing Co2 emissions.

The HERE ISA Map contains:

- Explicit speed limits visible on road signs as well as implicit speed limits derived from road signs without numerical values.
- Speed limits that are defined by road rules and regulations, including national, or regional, speed limits and conditional rules. These are typically not sign-posted and therefore not detectable by onboard cameras.
- Required road topology with selected attributes to minimize the data footprint for smaller vehicle segments while still enabling electronic horizon providers to power an ISA feature.

Multiple global automakers have already chosen the HERE ISA Map with their eyes set on the 2022 and 2024 timelines.

Spireon introduces its modular trailer management solution and IntelliScan[®] cargo sensor

Spireon is introducing the next generation of the FL Flex suite of products and IntelliScan cargo sensor under its FleetLocate[®] product line, timed with American Trucking Association's (ATA) Management Conference & Exhibition (MCE). The updated line of Flex devices provides ultimate flexibility with options that are faster to install with more power options, are wireless sensor-capable, and have an integrated cargo sensor. The enhanced next-generation IntelliScan cargo sensor adds volumetric capabilities to provide actionable information on available trailer floor space.

The new Flex suite includes a covert option available with wireless sensors, and new options for an integrated solar panel and IntelliScan cargo sensor. Flex products can be paired with various wired and wireless sensor options including door sensor, PSI ATIS, PSI TPMS, and temperature probe. This latest generation of trailer management devices works on all types of trailers and has options that can be installed in as little as 10 minutes on empty or loaded trailers, making customization easier and faster than before.

HERE launches advanced real-time traffic service

HERE Technologies announced the launch of its new HERE Advanced Real-Time Traffic service. It introduces new lane-level information and expanding inner-city coverage to help drivers reach their destinations more efficiently and stress-free.

HERE Advanced Real-Time Traffic is the traffic service that provides accurate speeds on arterial lanes with congestion at intersections, as well as the different speeds on roads with high-occupancy vehicle lanes (in Australia, Canada, New Zealand, and the USA). This gives drivers the chance to make informed decisions about the best routes for their journeys. The service includes granular traffic coverage in more than 100 cities worldwide, across all street types. HERE Real-Time Traffic is used by leading automotive companies, logistics providers, and city governments, and transportation agencies globally.

Invers offers detailed driving analysis

Invers's new driving analysis provides operators with detailed insights into vehicle status and driving behaviour. Sensors within the CloudBoxx telematics systems provide real-time in-

formation on locations and movements. From these, trip events such as sudden acceleration, fast cornering or hard braking can be detected. Unauthorized vehicle movements and location changes, such as those caused by parking bumps, suspected thefts or towing, can also be identified. FleetControl, Invers's fleet data management software, receives data directly from CloudBoxx, analyzes it, and reports on events when customizable thresholds are reached.

The data for the driving analysis comes directly from CloudBoxx, Invers's telematics system. CloudBoxx's standard features include all the necessary sensors to detect, measure, and provide data on accelerations and sudden movements as well as the vehicle's location and speed in real-time.

HEADLINES

- 3Dtracking expands portfolio of intelligent asset tracking solutions for container security
- Hub International launches Hub Drive Safe App
- HERE introduces global movement data service for advanced mobility analytics
- Geotab and General Motors expand integrated telematics offerings for fleet customers into Canada

Tata Motors to invest Rs 15,000 crore in electric vehicles

Tata Motors has major plans for its EV division with 10 new launches in the next four years and plans for investing up to Rs 15,000 crore. This comes just days after private equity major TPG Rise Climate decided to invest \$1 billion in the Tata Motors EV segment at a valuation of \$9.1 billion.

Tata Motors, which has two EV offerings as of now, is already a market leader with around 70% share in the EV segment. Tata Motors is averaging around 30,000 units over the past few months and with the launch of its mini SUV Punch, the demand is likely to go up further.

Euler Motors launches HiLoad EV

Euler Motors has launched its first electric cargo three-wheeler in the Indian market. The new Euler HiLoad electric cargo three-wheeler has been launched in India at Rs 3,49,999. The Euler HiLoad EV has been designed in India and the company claims that it is the most powerful electric cargo three-wheeler in the country. Also, at 688 kg, the HiLoad EV has the highest payload capacity across the three-wheeler cargo segment in India, including ICE models.

It is IP67 certified that makes it water-resistant. It is also equipped with advanced telematics and software assistance for fleet tracking, battery monitoring and real-time charging. The electric motor of this electric cargo three-wheeler produces 10.96 kW of peak power and class-leading 88.55 Nm of torque.

IIT-Hyderabad, ARAI sign MoU for autonomous vehicle technology

The IIT-Hyderabad's Technology Innovation Hub on Autonomous Navigation (TiHAN) has signed a memorandum of understanding (MoU) with the Automotive Research Association of India (ARAI). They will collaborate in the field of India-specific technology development, simulations, and the real-world verification and validation of ADAS and autonomous driving. TiHAN and ARAI will jointly promote research and develop and offer solutions, technologies, and practices to the industry to enable smart mobility in autonomous vehicles.

The collaboration will significantly contribute to safe and sustainable autonomous mobility solutions in India and provide greater insight into TiHAN activities. It will update testbeds on autonomous navigations (aerial/terrestrial) in the campus, the Project Director of TiHAN-IIT-H stated. The collaboration will also promote the innovation ecosystem, skill development, and entrepreneurship activities in the area of autonomous navigation systems.

India launches E-Amrit web portal for all EV related information

The central government has launched a web portal for electric vehicles at the United Nations Climate Change Conference in Glasgow, Scotland, Called E-Amrit. The website will be a one-stop destination for all information related to electric vehicles such as their purchase, investment opportunities, policies, and subsidies, NITI Aayog said in a statement. The web portal will also bust myths around the adoption of EVs. It will essentially complement all the initiatives being taken by the government on raising awareness on EVs and sensitizing consumers on the benefits of switching electric vehicles. The E-Amrit to portal has been developed and hosted by NITI Aayog under a collaborative knowledge exchange program with the UK government. This is a part of the UK-India Joint Roadmap 2030 that has been signed by the Prime Ministers of both countries.

HEADLINES

- MG becomes the first automotive company in India to bring industry-first services under the car-as-a-platform model with Astor
- BSES ties up with startup to install subsidized EV charging stations in Delhi
- Tata Power completes installation of over 1,000 EV charging stations
- Odisha announces full tax exemption for electric vehicles, registration fee waiver
- Hyderabad-based Olectra bags Rs 140-crore order from APSRTC
- eBikeGo acquires Kustard Tech to strengthen its fleet management system offering
- Alternative fuel will make India number-1 in the automobile sector: Nitin Gadkari at India Today Conclave 2021
- Tata Motors joins hands with Endress+Hauser Flowtec to offer electric mobility for employee transportation

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