



Confederation of Indian Industry

FUTURE MOBILITY CONFERENCE 2019

26-27 February 2019, Bengaluru

Conference Outcome Report

The key takeaways:

- Electric mobility in India will be primarily driven by growing disposable income, increasing consumerism and digital exposure.
- In the coming years, mobility in India is expected to see a series of transformation. At the same time, the country will have to address challenges of traffic congestion, pollution, energy security and road accidents.
- The state of Karnataka has realised the relevance of electric mobility and has emerged as a front runner in driving electric vehicle (EV) penetration in the country. Today, Karnataka is the first state to announce subsidy on EVs for the sector to boom under a comprehensive and well-designed Electric Vehicle and Energy Storage Policy 2017. The state's policy framework for electric and sustainable mobility in the fields of EVs, charging infrastructure and battery technology will be a game changer in the industry and will be a model for other states. Karnataka's phased EV manufacturing strategy will aim at strengthening the local manufacturing and supply base and developing the local EV supply chain with emphasis on electric drive technologies.
- India has a strong policy on Make in India and the government is considering to prioritise storage battery manufacturing in India.
- The government and the industry need to work closely and take a holistic approach in institutionalising a process with which demand can be aggregated. For any OEM, the focus should not only be the manufacturing of the EV, but also to ensure the charging infrastructure is in place.
- For EVs to be a success, there are certain requirements. There is a need for proper urban planning which will incorporate creation of charging infrastructure as the city grows. Skill development and engineering capability in the EV industry is the need of the hour. It is not only important to adopt new technologies but also to make affordable technologies since consumers are not willing to pay a higher price for EVs. Further, the government and regulators need to test and validate the technological solutions before putting those into practice.

- The future of mobility is shared. Going forward, hybrids are going to play a very important role. There is a need to promote alternate fuels such as indigenous natural gas, ethanol, and coal derived methanol to reduce our oil imports.
- In the Indian context must be particularly grounded on consumer behaviours that is going to determine what are the transportation fuel types and the allocation of the transportation fuel types between the different forms that are available going forward.
- A mosaic of fuel solutions that will be predominant in most countries in the world. This will include fossil fuels, cleaner burning low emission fossil fuels, biofuels, CNG, LNG, methanol blends potentially and starting to look at electric and hydrogen.
- A technology agnostic electrified mobility is essential to realize future mobility.

The following section summarises the remarks made by each of the panellists/speakers.

Inaugural Session: 7 C's Vision: India's Roadmap towards Sustainable Mobility

Mr Vikram Kirloskar, Vice President, Confederation of Indian Industry (CII) and Managing Director, Kirloskar Systems Ltd and Vice Chairman, Toyota Kirloskar Motor, welcomed the participants to the maiden edition of the Future Mobility Show 2019 by CII. He delivered the opening remarks. He pointed out three basic issues in the ecosystem that need to be addressed. One is how to improve the environment and keep a clean and sustainable environment. Second issue is energy security as India is one of the biggest oil importers. With growing population, there is a need to sustain the energy requirements. For this, it is necessary to look at energy conservation and reduction in carbon emissions. The third issue is job creation. There is a need to increase manufacturing activities and create jobs.

Mr Chandrajit Banerjee, Director General, Confederation of Indian Industry (CII) provided a snapshot of the work being done by CII in the mobility sector. He highlighted CII's partnership with NITI Aayog in the MOVE Summit held in September 2018. CII's engagement was both on the policy and the technology fronts. The Government of India (GoI) through its various schemes has shown a great will to transform the mobility landscape of India by adopting new policies like the National Policy on Biofuels and National Electric Mobility Programme. CII through its focused Task Forces work to ensure moving towards a sustainable means of transportation in India, and to reduce cost and ensure secure supplies of raw materials for local manufacturing of storage batteries. Put simply, CII has worked towards advocating of policies that ensure energy security in a sustainable manner.

Some key recommendations in the space of electric vehicles (EVs) by CII include market creation and adoption; creating scale for "Make in India"; domestic manufacturing of vehicles, components and batteries; skill development across the value chain; strategic sourcing of key raw materials; and integration of renewable energy into the charging infrastructure. Another

important aspect of EV adoption is technology adoption. At present, this affects the public transportation apps and aggregators. CII will look to support integrated approach to technology adoption and technology development and innovation by industry-government-academia, especially for battery manufacturing. These recommendations were presented to NITI Aayog at various platforms and also to the Ministry of New and Renewable Energy (MNRE).

Biofuels is set to take over the Indian skies too. With SpiceJet operating India's first biofuel-powered flight from Dehradun to Delhi, it was a cornerstone for fuel from waste. Within Biofuels during 2017 – 18, CII played a significant role in facilitating the Government in drafting the new policy and viability gap funding (VGF) scheme. CII is now looking forward to work with the State Ministries to further the growth of biofuels.

CII is working and partnering with the government towards transition in the space of transportation. This will also help India as a country to fulfil its climate change commitments and set a global example.

It is therefore important for CII and its membership to look at various mobility options that is sustainable and is in line with India's climate change commitments.

Mr Banerjee thanked for the support of the Government of India -- the Ministries of Heavy Industries and Public Enterprises; Petroleum and Natural Gas; Road Transport and Highways; Environment, Forest and Climate Change and NITI Aayog as well as the State Government of Karnataka. He also thanked for the support and involvement of Industry Associations from India - ACMA, SIAM, PCRA, ARAI, SAE INDIA, SMEV and TERI, and support and involvement of associations from overseas - APEV-Japan, CHARIN-Germany. He welcomed the delegation from UK and announced that the three-day exhibition has special Country Pavilions of Japan and China. The exhibition focus is on technological advancements and innovations in alternate solutions to the conventional fuels to help achieve zero emission mobility for India in future.

Mr C.V. Raman, Chairman, CII Steering Committee on FMS 2019 and Senior Executive Director (Engg and R&D), Maruti Suzuki India Ltd extended a warm welcome to all the participants. India which has one of the youngest population has a huge potential. Unlike any other country, 75 per cent of vehicles in India are two-wheelers. Also, the auto industry has grown by 2.5 times in the last decade, with maximum growth coming from two-wheelers. At the same time, India's GDP at per capita at purchasing power parity is USD7,000 while it is USD59,000 for developed countries like the US. This means that India requires affordable mobility.

Mobility is a very basic need to commute from point A to point B, most effectively and economically. As per a recent TERI report "How India Commutes" on Mobility, 30 per cent of the Indians do not travel while 23 per cent commute on foot. 18 per cent of people use public transport for commuting and only 15 per cent uses private transport, of which 12 per cent is

two-wheelers and 3 per cent is cars. India, therefore, has a long way to go in making mobility accessible to all classes of people.

India has had shared mobility like shared autos and taxis since long, however the options have been modernised over time. This has been driven out of the need for affordable mobility options. In recent times, new services like Taxi aggregators have emerged which has created a bigger impact. This has increased accessibility to mobility and digitisation has played a key role in connecting the need and the resources to meet the requirement.

As the Indian economy continues to grow, future promises to be full of growth, challenges and new opportunities. Growing disposable income, increasing consumerism and digital exposure will be the key drivers that is expected to propel growth for India. Owing to this, mobility in India is expected to see a series of transformation. At the same time, India will have to grapple with the challenges of traffic congestion, pollution, energy security and road accidents.

Due to high congestion, average traffic speed in the Indian metro cities are reducing. This has a direct impact on the vehicular emissions. With a drop of vehicle speed to 20 km/hr from 40 km/hr, CO₂ emissions increases by 40 per cent. Technology solutions with use of connectivity may have to be worked on for intelligent traffic and parking management.

With regard to pollution, as per WHO report, 14 out of 15 world's most polluted cities are in India basis PM 2.5 emission measurement. To cater to the increasing pollution, the Government of India has planned to implement BS6 norms straightaway from BS4 in 2020. BS6 has stricter targets for vehicular emissions as compared to BS4. Diesel vehicles are impacted the most. NO_x limit is reduced by 68 per cent and particulate matter by 82 per cent. However, implementing stricter emission norms will not solve the problem because of about 9 million old vehicles (pre-BSI) are still plying on roads. In order to solve this problem, both policy and facility for the scrapping of vehicles is required.

With a growing transport sector, oil imports have increased over the years and is very high today. 85 per cent of crude oil is imported in India that accounts for 20 per cent of total import bills. With further growth in the sector, India's crude consumption will increase. India will have 70 million cars by 2030 considering growth at 8 per cent CAGR from now. If we consider 20-30 per cent EV penetration by

2030, internal combustion engine (ICE) vehicles will be 83 per cent and EVs will have 17 per cent share. There is a need for practical and feasible solution to reduce consumption in 70-80 per cent of non-EV cars too. A technology agnostic approach with focus on alternate fuels and hybrid electric vehicle (HEV) is required to have a larger impact on reduction of oil imports. To do so, there is a need to localise HEV and EV technology to reduce cost through "Make in India".

Another major problem faced today is high road accidents. Every year, around 150,000 people die in road accidents in India. India has very high road fatality rate with 12 deaths per 100,000

people as compared to 3 deaths per 100,000 people of developed countries like the UK and Japan. India's road infrastructure situation is different with respect to developed nations. Simply using technologies designed for developed nations may not work in India and hence major efforts are required to reduce the high road fatalities and provide safe mobility.

To address all challenges, Honourable Prime Minister of India shared his Vision during the MOVE Summit 2018 and set up the context for future mobility. He has given the mantra of 7Cs - Common, Connected, Convenient, Congestion Free, Charged, Clean and Cutting-edge. These 7Cs encompasses the entire mobility domain and holds the essence on which the efforts should focus upon.

Taking Cue from the 7C's, CII has come up with the objectives for future mobility, that is, promoting all green solutions for energy security, reducing local city pollution by introducing BS6, xEV technologies, CNG and LNG etc., urban transformation through shared, connected and green mobility solutions, enabling local manufacturing of xEVs and alternate fuel vehicles,

and progress of society and industry together through responsible mobility. To achieve the Government's vision of future mobility, there is a need to find solutions to these challenges.

Worldwide, the future of mobility is talked about through its acronym ACES -- Autonomous, Connected, Electric and Shared. However, in India, the future of mobility needs to solve its own problems which are different from the world. Therefore, ACES for the world is Autonomous, Connected, Electric and Shared while for India, it should be Affordable, Connected & Shared, Eco-friendly and Safe.

Mr K J George, Hon'ble Minister for Large and Medium Scale Industry Government of Karnataka, was optimistic and said that the Karnataka Government has always given EVs special and concerted attention and is willing to walk that extra mile to support e-mobility further. E-mobility is already shaping and will continue to shape the automotive industry in India and around the world. By 2030, electrification could lead to EVs holding a substantial share (up to 50 per cent of new vehicle sales in a breakthrough scenario) of the global automotive sector. Karnataka has realised the relevance of electric mobility and has emerged as a front runner, determined to play a vital role in driving EV penetration. Karnataka -- a pioneer state and home to first EV in the country produced by Reva Electric Car Company belongs to Maini family, later on taken over by Mahindra Electric Mobility Limited. Today, Karnataka is the first state to announce subsidy on EVs for the sector to boom under a comprehensive and well-designed Electric Vehicle and Energy Storage Policy 2017. Karnataka's policy framework for electric and sustainable mobility in the fields of electric vehicles, charging infrastructure and battery technology would be a game changer in the industry and will be a model for other states. Karnataka's phased EV manufacturing strategy will aim at strengthening the local manufacturing and supply base and developing the local EV supply chain with emphasis on electric drive technologies. Bengaluru has been the centrepiece of Karnataka's EV evolution, home to only India's electric car manufacturer Mahindra Electric and one of the most promising electric mobility start-ups.

He outlined the key initiatives for driving e-mobility in the state. These include India's first ever electric technology manufacturing hub in Bengaluru by Mahindra Electric Mobility, India's first public EV charging station set up by BESCOM at Bengaluru. First of its kind in India, 108 government locations spread across Bengaluru have been identified for establishing EV charging stations for which bids will be floated by BESCOM. The State Government of Karnataka aims to replace 50 per cent of the diesel and petrol vehicles used by the state government staff in Bengaluru to eco-friendly EVs by 2019. The state government has issued operational guidelines for EV policies for effective implementation of the policy. The Urban Development Department would be amending the Building Bye-Laws to mandate between 10-20 per cent of the parking space reserved for EV charging. The government has also developed an app for EV owners to locate and find the slots available in the EV charging infrastructure. An action plan is being firmed up for campaigning to popularise EV and EV charging locations by devising an attractive logo, preferential parking for EV and attractive and legible signages across the city.

Mr Manoj Kohli, Chairman, CII Task Force on Electric Mobility and Battery Storage and Executive Chairman, SB Energy (SoftBank Group), delivered the concluding remarks by saying that the two transformations -- energy transformation from fossil to renewable and transport transformation from internal combustion (IC) engine vehicles to electric vehicles -- are very closely interlinked. India, fortunately, has taken a leadership position in both these transformations. The present government has been really encouraging in both the transformations. Similarly, on the EV front, it is very clear that the Government of India is putting a lot of new policies in place and wants the country to lead in this area.

There are two aspects of transformation which are important. One is the issue of ride sharing which has started globally. India is now in the midst of this ride sharing innovation. Ride sharing along with electric vehicles is a very powerful combo because the more electric vehicles and the more ride sharing, the more positive will be the impact on the environment and on climate change. The second issue is manufacturing of battery storage. India has a strong policy on Make in India and the government is considering to prioritise storage battery manufacturing in India.

Session I: Make in India: Manufacturing Hub for Auto Industry

The Government of India has been actively pursuing "Make in India" program to promote manufacturing and production of goods and services locally. The automotive sector, contributing 49 per cent of manufacturing GDP, has been a key driver in this regard. However, the sector is currently undergoing through many challenges with regard to the regulatory framework, skill and infrastructure development, global competition and technological innovations/ disruptions.

This session deliberated on how both the Government and the industry can work together to enhance the regulatory environment, develop skill of labour workforce, fast-track infrastructure development, incubate R&D and innovation, and enhance supply chain

competitiveness to create an enabling ecosystem so that India can emerge as a world-class automobile and automotive value chain manufacturing hub.

Mr Deepangshu Dev Sarmah, Editor-in-Chief, Auto Tech Review, the moderator of the session, requested the panelists to share their perspective on manufacturing in the auto sector and Make in India programme of the government.

Mr Nishant Arya, Chairman- CFT-EV, ACMA & Executive Director, JBM Group, believed that manufacturing of EVs in India is important to bring down costs and make them affordable. The government and the industry need to work closely and take a holistic approach in institutionalising a process with which demand can be aggregated. For any OEM, the focus should not only be the manufacturing of the EV, but also to ensure the charging infrastructure is in place. Public transport like e-autos and e-taxis will be early adopters; both would coexist for a period of time. Companies need to prudently see how they are investing in different technologies and at the same time, they would need to take the plunge to invest whether in R&D technology or manufacturing or other end-to-end solutions. Skill development is also important in the area of EVs. There needs to be more of collaboration and cooperation rather than competition.

Mr Shekar Viswanathan, Vice Chairman and Whole Time Director, Toyota Kirloskar Motor asserted that Make in India is important given that the national objective is to improve manufacturing output from 16 per cent of the country's GDP to 25 per cent. The Make in India programme also helps to increase employment in the manufacturing sector.

The growing focus to shift to EVs is primarily driven by the fact that India has the world's most polluted cities and there is a need to reduce pollution. The key requirement is to take small steps in introducing EV technology in different parts of the country. For instance, charging infrastructure needs to be installed in the industrial estates in our country.

A major challenge is the urban agglomeration. There is a need for proper urban planning which will incorporate creation of charging infrastructure as the city grows. These is a step that the government must take and enable to make EVs a success.

Another issue is the cost of EVs. Typically, when prices of crude oil and gasoline increase at the pump level, the demand for EVs and other forms of alternate energy also go up. Conversely, when crude oil prices go down, the demand for EVs seems to wane. What is required is to take deliberate steps to achieve the EV target over the next 20-30 years.

Currently, EVs are charged 12 per cent GST, which is reasonable. The tax regime has to be very steady and this is an important point to be debated and deliberated as the sale of cars contribute a great deal to the exchequer not only to the central government but also to the state governments in the form of road tax, registration tax, etc.

Mr Guruprasad Mudlapur, Managing Director, Robert Bosch Automotive Electronics Pvt. Ltd agreed that moving to EVs will solve pollution issues considerably. The need of the hour is engineering capability in the EV industry. The auto industry in India currently has excellent manufacturing infrastructure and engineering base. Design of vehicles in the country is also

required besides manufacturing. Today, the automotive world is extremely software oriented. Therefore, highly skilled people are required in this area.

Dr J Dhinagar, Vice President, TVS Motor Company believed that two-wheelers, from a Make in India viewpoint, are one of the shining examples in the Indian industry. Out of the 1,200 parts integrated in a two-wheeler, almost 99.9 per cent are made in India by multiple vendors. Today, around 25 million two-wheelers are manufactured in India every year at the frequency of 8 seconds. Movement of two-wheelers to electric is a good step, but the challenge will be manufacturing of the parts in India with the best technology. The price of electric two-wheelers will be another challenge to retain the customers.

Mr Tarun Mehta, Co-Founder, Ather Energy echoed the perspective that EVs in India will start from two-wheelers as they have simple technology and can be manufactured in huge volumes. India is the biggest two-wheeler manufacturing country in the world. The main challenge in moving to EVs is adoption of new technology. Technology changes very rapidly, be it batteries, chargers, motors, controllers, etc. It is therefore important to adapt to the latest technologies. As these technology changes take place, the industry will have to learn,

change the business model to be able to innovate very rapidly and be able to introduce their products quickly into the market. This will ensure that Make in India will continue. Further, there will be need for skill development with EV transformation. Significant investment is required in development and engineering.

SESSION: Digital Solutions for Future Mobility

Mr Brahmanand Reddy Patil, Managing Director, Vector Informatik focused his discussion on evolution of the automotive electronics and software in vehicles and how it is preparing for the future mobility megatrends. This evolution is heavily dependent on user experience and therefore, resulting in traditionally embedded software becoming more complex. However, the challenge is that the software that runs in the automobile must be highly safety critical and highly responsive as well. This challenge must be dealt with in a systematic way both by the OEMs and the supplier ecosystems. He also emphasised that the newer software in vehicles should also have the capability to connect to the external world through various means to support multiple functions that are required for functioning of the vehicle as well as the future trends and future requirements. OEMs are looking at the data that is collected in the car, managing it remotely, not waiting for the car to reach service station rather proactively look at prognosis or predictive diagnostics kind of concepts. This data which the OEMs receive, through the new software, helps them analyse consumer habits and trends and then commercialise the cars based on consumer needs.

Mr Shree Harsha, Business Consulting Director – Transportation & Mobility, Dassault Systèmes, keeping with the theme of digital solutions for Future Mobility, highlighted that evolution of a car company in the future will not only be limited to selling new products to its consumer. Evolution of a car company will be assessed on how well it can sell mobility as a service which will be an add on to the product. Future mobility needs to be conceptualised with the citizen being at the centre of the whole planning. In addition to this, the larger

mobility infrastructure and ecosystem of the region needs to be taken into consideration while providing the services as each citizen's need will be different in different regions. To ensure that these services are provided in a proper manner, Dassault Systemes in Singapore is working towards linking smart city project with the mobility ecosystem which will provide digitised services to citizens as per their needs. For a citizen/consumer, what matters is a hassle-free travel from point A to B irrespective of the transportation whether it is car, Ola or an Uber or a cycle or an EV car or a hybrid electric car. Therefore, for the car companies, the commercial business lies in how well they can cater to the consumer needs between point A to B.

Mr Sridhar Dharmarajan, Managing Director, Indo-Pacific Region, MSC Software, takes the conversation of digitisation of future mobility to the next level by fusing the digital world and the physical world. He emphasised on the making digital stimulations of the realist world have been achieved through evolving software. However, the challenge is to modify the existing real systems and

make them more effective. Therefore, the focus of MSC Software captures the existing physical world and digitize it and perform the stimulations which can be implemented back to the real world. MSC software through the help of computer aided engineering (CAE) world has the capacity to simulate the realistic behaviour. He believes that the future mobility technology needs to be "smart" to enable companies transition from one form of technology to another. For example, transitioning from an IC engine space to EV space would require MSC software which will help in performing stimulations in a smarter and faster manner which then can be realistically implemented on the ground.

Session II: Responsible Mobility: Building A Sustainable Ecosystem

India is a country of billion plus people and need for mobility is going to increase in future. Considering the economic strata of the society and the need for various modes of mobility, a well thought out strategy for future mobility needs to be put in place. At the same time, India faces some of the greatest environmental challenges today. A part of this problem arises out of mobility. People need a seemingly infinite network of vehicles and transportation systems for the progress of society and economy. While there are issues of local city pollution, India also needs to look at the issue of global warming related to carbon emissions. In this session, the stakeholders deliberated on short, medium and long-term policy roadmap for the nation covering the following major aspects:

- Alignment of various initiatives for an integrated view of country's mobility needs
- Enabling policy environment for building capacities & align capital investments for mobility sector
- Encouraging technological innovation for creating affordable solutions for India

- Infrastructure development with city, state and central government partnership
- Solutions to help India make the transition towards a mobility ecosystem which is cleaner, cheaper and sustainable

Mr Sujith Nair, Co-Founder & CEO, Open Mobility Foundation made a presentation on Responsible mobility through open interoperability. Mobility in today's time has become a digital service. Future is indeed going to be based on shared mobility. We should be aiming to help further expand the shared mobility to decongest the roads. He pointed out that in the last six decades, i.e. between 1950 and 2008, we have added about 10.5 crore vehicles on to the roads of India and the alarming fact is that the same figure has doubled in six years between 2009 and 2015. As a result, a lot of space is being used to move people which adds a lot of pressure on the cities. Further, 50 per cent of CO2 emissions in Delhi is from transport. The average speed in Bengaluru is only 17 km per hour.

The future of mobility is shared and multimodal. Today, mobility does not remain a physical form of transportation product. It has actually become a digital service that can be accessible on a click of a button. Going forward, shared mobility has to become a viable alternative to an owned personal vehicle and thereby decongest the cities across the world.

Mr Hormazd Sorabjee, Editor -in- Chief, AutoCar, the moderator of the session, pointed out that the need of the hour is mass rapid transportation and shared mobility. He requested the panelists to share their thoughts on the issue of responsible mobility.

Mr N. Sivasailam, Special Secretary, Logistics, Department of Commerce, Ministry of Commerce & Industry said that the logistics sector is concerned with cost reducing technologies. It is very important

to reduce the cost than finding an alternative. Logistics costs are very high in India. For instance, logistics handling cost at JNPT in Maharashtra is almost three times costlier than international ports of Singapore, Colombo or Jebel Ali. Technology in logistics needs to be more as a method of reducing cost rather than substituting them.

Mr B. Basavaraju, Principal Secretary, Transport, Government of Karnataka said that the transport sector is transforming across India. In Karnataka, subsidies and regulations are at discussion stage. There should be some kind of exemption to be given to EVs.

From the transport department, we have released about Rs 5 crore to BESCO to establish charging stations in Bangalore. Unless the charging stations are established, the vehicles won't come into operation.

Mr Vijay Jaiswal, Director of Automotive, Government of Telangana emphasised that development of mobility ecosystem or urban infrastructure in India should be focused on tier-2 cities. There is a need to develop a plan which is integrated and synchronised with the expectation and aspirations of the people in the cities.

Subsidies for EVs have helped in global nations like the US, Norway and China. This is primarily because it brings down the price gap between IC and electric vehicles. We are however looking at road tax exemption. Subsidies are given at the Central level.

Prof R.V. Ravikrishna, Professor - Department of Mechanical Engineering, IISc Bengaluru spoke on well-to-wheels (WTW) Analysis, which is a lifecycle of automotive fuels in the Indian context, and the policy roadmap for India. The lowest emission in a vehicle corresponds to

fossil fuel hybrid. Hybrid vehicles give the highest possible energy efficiency and the lowest emissions in the current scenario of India. For example, CO₂ emission of CNG hybrid is much lower than that of a battery electric vehicle. Notably, the diesel electric hybrids are the most energy efficient and CNG-electric hybrids are probably the least polluting.

To make battery electric vehicles the least emitting and the most efficient, there is a need to cut down power T&D losses, which is very high at 28 per cent. We need to shift from coal and natural gas based electricity to more renewable sources.

There is a need for electric mobility because the immediate direct benefit is the improvement in the urban air quality. What is required is to look at all possible scenarios and technologies for our country.

According to a study from Energy Transition Institute in the Netherlands, charging battery electric vehicles from power derived from coal could lead to a counter intuitive increase in CO₂ emissions. It is therefore important to look at alternate fuels.

To sum up, there is a need for a comprehensive transportation and energy policy together. What is required today is electrified mobility rather than electric mobility. Hybrids are going to play a very important role. There should be a technology that the auto industry should get into and more importantly, the government should give tax benefits on hybrids. There is a

need to promote alternate fuels such as indigenous natural gas, ethanol, and coal derived methanol to reduce our oil imports.

Mr C.V. Raman, Senior Executive Director (Engg and R&D), Maruti Suzuki India Ltd offered the perspective of the auto industry. Over the past few years, the auto industry has been a major contributor towards GDP, close to 7%. About 50% of the manufacturing is coming from the auto sector. Around 30 million people are getting employed in the auto industry and ancillaries and related industries. Rapid urbanisation in the country has led to growth in transport demand. Going forward, there is a need to look at how we are going to look at mobility solutions. Mobility in future is going to become a service, which could be shared, personal-owned, or mass rapid transportation, or buses.

From a consumer perspective, it is very clear that a consumer today looks at total cost of ownership while buying an EV. The auto industry is moving from BS IV to BS VI norms. Several safety features have been incorporated in the new regulations, which is increasing the cost of EVs. However, consumers are not willing to pay a higher price since affordability is more important than vehicle technology for consumers. It is therefore important to make affordable technologies.

Session III: Smart, Shared and Connected: India's Urban Mobility Landscape

Traffic congestion has increased dramatically in India over the past few years. Congestion and the associated slow urban mobility can have a huge adverse impact on both the quality of life and the country's economy. Convenience, predictability and reliability are the three focus areas when we look at smart urban mobility. In addition to this, it is important to ensure that India moves towards fostering greener, faster and cheaper mode of transportation for all.

This session deliberated on strategies to transition to alternative transportation modes to help metropolitan areas reduce traffic congestion and reduce pollution. It also discussed the

necessary steps that were required to be taken by industry and Government to meet the changing mobility needs of urban cities.

Mr Sumantra B Barooah, Editor – Auto car Professional, the moderator of the session, requested the panelists to share their thoughts on smart mobility options.

Mr Manish Agarwal, Vice President Infrastructure & Head Sales & Business Development, Mobility Division, Siemens Limited made a brief presentation on the concept of e-Highway which is being promoted by Siemens in Germany and as pilots in two countries, Germany, Sweden and America. The e-Highway system unlocks its full potential for cleaner road transport in combination with other alternative fuel technology. The concept of e-Highway is exciting for the auto industry. It is disruptive for the auto industry in some way because it will slightly move the focus from the combustion engine. The other application under

development is how to use it specifically from India perspective in an urban landscape as a feeder service, as a hybrid light rail method of last mile connectivity or a last few miles of connectivity and that is what is work in progress. Intelligent traffic management systems is critical in the current urban landscape of mobility as it will help to reduce congestion and improve the vehicle speed.

Mr Ashwin Mahesh, Co - Founder, Lithium Urban Technologies Private Limited raised a few points on urban mobility and solutions for urban mobility. Mobility solutions are required for metropolitan region around the large cities. We need to design the cities in such a way that it addresses the issues of both housing, employment and mobility. Urban areas need increase in public transport. We need more applied intervention strategies in which solutions are tried and products are continuously refined and developed for the solutions as they are being tried.

Dr Naveen Gautam, Managing Director, Hella India said that if the number of cars on roads doubles, the average speed of cars drops down by one-fourth. Growth rate in metro cities in India is much higher than tier-2 cities or rural areas. One pain area was the heterogeneous traffic on roads, that is, different types of vehicles moving on the same lane. Another concern was that cars are highly underutilized, in fact the most unutilized vehicle on the road space compared to pedestrians, cyclists, metros or buses. An important issue was construction of bridges or flyovers to divert the traffic, which leads to congestion as there is lack of proper planning. Further, last mile connectivity is important for public transportation.

Mr Rajnish Goyal, General Manager – ESSG, Bharat Heavy Electricals Limited (BHEL) said that a multi-dimensional approach is required in planning cities as the availability of mobility infrastructure has not really kept pace with the rapid urbanisation in the country. This rapid urbanization and requirement of transport has put a lot of strain by way of congestion, pollution, affecting quality of life and resulting in wastage of resources and time. Mobility aspects have therefore to be kept in mind at the planning stage itself. We also need to focus on encouraging non-motorized mobility. For this, there is a need for social and cultural change in the minds of people.

Electric transport is an economical option and it reduces carbon dioxide emission. Electrification, digitalization and smart grid have to be addressed together. The government agencies and the industries have to work hand in hand. What is required is a nodal agency at

central level, state level and local level so that all planning, operations, and execution are planned and implemented in a proper way.

Mr Nishchay AG, Director-Supply Chain, Bounce reiterated the fact that first and last mile connectivity to metro stations in cities is important. Bounce offers scooter sharing platform. Bounce's keyless scooters allow users the convenience of picking up a bike from anywhere through its app and dropping it at any location once they reach their destination.

Mr V.A. Pankhawala, Deputy Director (Business Development & Corporate Planning), The Automotive Research Association of India (ARAI) felt that we need to overcome several challenges to move to e-mobility solutions in the country. Safety of technologies is critical; testing and validation will be required. The government and regulators need to test the

solutions before putting those into practice. This calls for devising the right standards and testing methods.

Session IV: Future of Transportation Fuel in India

Mr G S Krishnan, Managing Director, Novozymes South Asia Private Limited talked about how their company is playing a leadership role in the segment of bio – energy on finding ways to support various technologies in the conversion of agriculture residues to ethanol. With regards to bio-refining to produce fuel for future clean transport, Mr Krishnan is of the view that India has sufficient agricultural residue not just to take care of its own requirement of fuel but to also support the rest of the world. However, he pointed out that India faces challenges of accessibility of these agriculture residues but from the technology point of view there are at least some successful commercial facilities which are being established. The Ministry of Petroleum mandate to the oil marketing companies to set up 12 bio-refining facilities is a big move to ensure India can showcase its technological ability in bio-refining. The success of this technology will not only have a big impact on the automobile industry but also on the country's overall economy growth. IEA has calculated that bio – fuels have a huge potential in lowering carbon emissions as by 2060 a production of 290 billion liters of bio-ethanol by 2060 will result in a Carbon Capture Storage equivalent to 240 million metric tons of CO₂ removed from the atmosphere. Other advantages of bio – fuels include production of 43 million tons of protein rich animal feed as a byproduct, 140 million megawatts of bio electricity, 31 billion metric tons of bio methane, again from the bio gas needed for transportation and 240 million tons of CO₂ is removed from the environment.

Mr P K Pandey, Vice President – Marketing, Indraprastha Gas Limited continuing with the theme of the session on clean fuel for future transportation talks about Hydrogen is an alternate clean fuel for future mobility. IGL in collaboration with Indian Oil Corporation Limited will put up a station to blend of hydrogen with CNG. Another alternate fuel in Liquefied Natural Gas (LNG). Presently, IGL has 5 LNG terminals and the plans to increase it to 15 in the next a five year. The Ministry of Transport, GoI has come out with a Motor Vehicle Act which accepting LNG fuel for automotive. Mr Pandey highlighted in the span of the next 8 years 60 per cent of India will have available gas and 10,000 CNG stations will be set up. The Government's intent to push for natural gas is because they believe that clean fuel should be

the future fuel. The pollution levels have certainly reduced and a lot of trucks are converting into CNG vehicles. Even the OEMs like Eicher, Tata and Swaraj Mazda they have come out with the LCVs which are running on natural gas. Even Maruti Suzuki, Ford and Hyundai have come out with the number of variants. However, given this Mr Pandey concludes that coexistence of different clean fuel varieties is the future for mobility as the one aim of these technologies is to achieve is a clean and sustainable environment.

Mr Nitin Prasad, Chairman, Shell Group of Companies, India elaborates on how the primary driver for the transportation fuels and the future transportation fuels must be the emissions conversation on an integrated basis. He also emphasized that the conversation about the applicability of mobility aspects is very much tied into our ability to develop the country and take the country forward. The third aspect is that at the end of the day any mobility conversation or for that matter any energy transition conversation in the Indian context must be particularly grounded on consumer behaviours that is going to determine what are the transportation fuel types and the allocation of the transportation fuel types between the different forms that are available going forward.

Today transportation fuels are being used across all sectors (aviation, road seas, etc.) in the variety of different forms and usage. So, in the next 3 to 4 decades one sees fossil fuels and blended fossil fuels and lower emission fossil fuels playing a significant role in these sectors going forward. However, when you talk about heavy duty transportation the blue corridor about having LNG trucks in place and starting to see CNG potentially as a solution even in the LCVs and the intra-city movement, for goods movement coming into place which is the categories that are there.

Mr Prasad is of the view that Electrification will happen. It is an extremely accelerated scenario moving forward. To meet the Paris accord, there needs to be 80% if not 100% electrification of passenger car vehicles going forward in the 2040s and in the 2050s for the world to meet those emission standards.

He further dwells on the different types of clean fuel in India especially Hydrogen is a space where Shell has invested for the last 2 ½ decades and have a commitment to build 400 hydrogen stations. There are 10 or 15 already operating between California and Germany and 400 more are in the pipeline to be built in in Germany. Mr Prasad expects this to be a solution that is more commercially viable and ready to scale up starting in the 2030s and going in the 2040s and really starting to hit in a more significant way in the 2050s. In addition to this, Shell is doing tremendous amount of research in this space of batteries for EVs in the Bangalore facilities.

Lastly, Mr Prasad outlines some challenges for transportation:

- Open / free market for range of different solution to emerge
- Confusion and uncertainty for investors
- Infrastructure development
- Standardization (electric vehicle charging)

Mr Prasad concludes with saying that a mosaic of fuel solutions that will be predominant in most countries in the world. This will include fossil fuels, cleaner burning low emission fossil

fuels, biofuels, CNG, LNG, methanol blends potentially and starting to look at electric and hydrogen. Ultimately consumers are going to have tremendous amount of flexibility and choice that the industry should be able to provide full range of choices for consumers across India. Lastly, from an emission point of view today automobile vehicles account for 25% of the energy being consumed. It also accounts for 20% of the energy related emissions that are there. So, this sector needs to be addressed for India to meet article 6 in its Paris ambitions.

Dr Reji Mathai, Chief General Manager (TPF), Indian Oil Corporation R&D Centre, talked about the future of transportation fuel from the point of a view of the Indian oil company and its role in decarbonization and reduction of oil imports by 10 per cent as per the Government's mandate. He echoed with Mr Pandey's view for ensure energy security for India one should diversify into CNG and a LNG. In this regard, Dr Mathai mentions that IOC is looking extensively into gas as it is low carbon intensive fuel and secondly its pricing is not linked to crude. With regards to EVs, IOC is pitching to be a future provide for energy storage. However, Dr Methai argues that though EVs is future but the oil, the fossil fuel will continue exist parallely at least for 10 to 15 years.

Mr Raju B Ketkale, Senior Vice President & Director (Product Design and Development), Toyota Kirloskar Motor, believes that electrocution of the automotive sector is a necessary. Toyota is committed towards creating a low carbon society. By 2020, Toyota plans to roll out its first commercial EV. By around 2025 electrified grades available in all Toyota and Lexus vehicles and by 2030 we will be producing more than 5.5 million electrified vehicles and in that more than one million will be electric vehicles and FCV. Mr Ketkale agrees with Mr Nitin Prasad's point that consumer's acceptance of the kind of technology they want to buy is the key. Therefore, a technologically agnostic is the best way to meet the national objectives. Toyota also strongly believes that hybrid technology is best for developing battery electric vehicle as well as hydrogen fuel cell. There are three core components – motor, battery and inverter and they are the common components for all technologies. These three components plus engine is the hybrid electric vehicle. These three components plus engine plus external charging is the plug-in hybrid. These three components plus only external charging is BV, these three components plus fuel cell and hydrogen tank is the FCV. This technology agnostic approach and bringing in mass production in these three components is the key for localization. Hence, technology agnostic electrified mobility is essential to realize future mobility.
