



# EVCONNECT

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NEWSLETTER

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## FROM THE CEO'S DESK

Dear Friends,

I am pleased to present to you the eleventh issue of EVConnect.

Last month, on June 5, we celebrated World Environment Day whose theme was curbing air pollution. It was a clear reminder of the role electric mobility can play in Indian cities that are grappling with the strong challenges posed by depleting air quality. India's electric mobility landscape is shaping up in this direction but a lot more action needs to take place on the ground and a lot more stakeholders need to work together. We firmly believe that the knowledge we share through the newsletter will allow all of us to learn the new dimensions that electric vehicles and their ecosystems bring.

New developments are taking place at a very rapid pace, and it is often difficult to keep pace. These are reported through multiple media channels and are hard to track. This newsletter seeks to bring together several of these developments into one accessible document. We hope this curated and compiled content will come in handy to those who are seeking the latest information on electric mobility.

This edition of the newsletter includes a conversation with Mr. Saurabh Kumar, Managing Director of Energy Efficiency Services Limited (EESL), a joint venture under the Ministry of Power. We discuss with him the role of energy efficiency in India's mobility system. In addition, we bring to you a feature that demonstrates the promise of electrification in light and commercial vehicles. We also tested what is it like to have a fully electrified travel from Delhi to NCR, and we present our field visit to you in the form of a video, which is attached in this newsletter.

We hope you find this edition of the newsletter beneficial and share your thoughts so that we can improve further.



Sincerely,

Dr. OP Agarwal  
CEO, WRI India

## WATCH

Presenting the monthly EV Connect Powertalk interviews exclusively discussing insights from EV experts. We also present one hand picked video to showcase EV innovations from across the world.



**Power Talk with Mr Saurabh Kumar,**  
Managing Director, Energy Efficiency  
Services Limited (EESL), Delhi



**Why you should go electric?**



# POWERTALK

## IN CONVERSATION WITH MR SAURABH KUMAR

MANAGING DIRECTOR, ENERGY EFFICIENCY SERVICES  
LIMITED (EESL), DELHI

*Interview taken by Neha Yadav, Research Consultant, WRI India  
(Copy-edited for the print version)*

“We kickstarted the electrification drive for the public sector where we went to the government and said we will electrify your fleet at almost similar costs of what your current hiring of vehicles are. You can pay us over a period of six years and after that the vehicle becomes yours. We put out a 10,000 car tender. We have deployed 1,500 cars and another 1,500 cars are on the anvil.”

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“By 2022, we expect 175 GW of solar and wind energy to be installed in the country. Now this means that about 20-25% energy will only come from solar and wind that happen to be infirm power.”

**Interviewer:** As a public sector company, you and your team have created a world-renowned energy efficiency programme for LEDs. Now, why should India create an energy efficient transport system?

**Mr Kumar:** Let me first thank WRI for interviewing me. The reasons are 2 or 3 fold. Number 1 is the larger issue of energy security – our dependence on oil and gas which is largely imported. Number 2 - we have an opportunity to move people towards efficient transportation given that personal mobility is still very low – 2–3 % of the people actually own vehicles. This will rise dramatically. In the US it is about 90%. And Number 3 is air pollution, which we are experiencing in virtually all urban conglomerates. Shifting from oil to e-mobility makes for a more efficient transportation system and also helps India achieve its climate goals. Just to give you an example – the most efficient ICE vehicle today emits about 90 grams per km of CO<sub>2</sub> whereas for the EVs currently available, and if we go by the current electricity grid which is largely CO<sub>2</sub> based, the emissions are 70 grams of CO<sub>2</sub> per km, which can actually come down to 50 grams per km if we have renewable energy integration. A combination of these four factors makes for efficient mobility that is a must for the country and for sustainable development.

**Interviewer:** In your expert opinion, what are the key policy and business ideas that India should pursue in order to reap the best rewards of an electric mobility system?

**Mr Kumar:** Well, some of them are already being put in place. Three very distinct things have happened over the last year. Starting May 2018, the Ministry of Power clarified that charging of EVs is not sale of power. This is a very important clarification because otherwise it becomes a licensed activity. The second thing is what kind of charging do we need in this country. On 14 December 2018, the Power Ministry came out with guidelines that public charging stations must have all kinds of connectors so that everybody can charge or recharge their EV. The third important part is FAME 2 which was announced just before the elections.

I feel it is important because: a) It doesn't incentivise private mobility which is the right thing to do. Instead it incentivises public transportation, 2 and 3 wheelers which is a very large segment and a limited number of shared mobility vehicles, which is 35,000. And the fourth thing is that it incentivises up to 100% public charging infrastructure. So I think this is what has already been put in place. The key challenges is the business model as you talked about. How does a charging station becomes viable, given that in the next two or three years you are not going to see enormous amounts of vehicle growth. Also, the FAME 2 subsidy is a limited subsidy. So you would like to see more and more public charging stations come up to ensure that there is electric mobility. So we need to develop innovative business models which strike the right balance between investment returns and the social mandate of putting large number of public charging stations on the ground.

*Interviewer:* What are some of the key constraints in scaling up electric mobility at this stage?

*Mr Kumar:* Essentially three if you ask me. First is public charging stations themselves which link to the range anxiety issue. Which then links to that fact that because there is no demand there are not many people willing to come up with electric vehicles whether it is two-wheelers, three-wheelers, four-wheelers or buses. The third is the overall lack of awareness on the benefits that an individual, a state and a nation can have in switching to electric mobility. So these are three challenges that we face.

*Interviewer:* What is EESL doing in this regard currently and what future projects can we hope to see?

*Mr Kumar:* So we have done two things. A) We kickstarted the electrification drive for the public sector where we went to the government and said we will electrify your fleet at almost similar costs of what your current hiring of vehicles are. You can pay us over a period of six years and after that the vehicle becomes yours. We put out a 10,000 car tender. We have deployed 1,500 cars and another 1,500 cars are on the anvil. This programme actually created the momentum for the ecosystem to move quickly. Most importantly, it builds confidence on the question whether electric vehicles actually work and given that most vehicles are more than an year old here in Delhi, and elsewhere, people are very much aware and this is something workable. B) The public charging infrastructure. We have not waited for the FAME 2 subsidy to come in. What we did is that we created an innovative business model and went to municipal bodies and said please give us parking spaces in high-end commercial areas like Khan Market and Jor Bagh and give us the interconnection that is needed for the charging station to work. We will put our charging stations and operate it over the next ten years and pay your 70 paise of every kilo watt hour (kWh) of everything I charge. This is in lieu of the rent and the cost you have incurred in giving me the connection. So we have taken a leap of faith and have put about 40 charging stations in central Delhi and in the next two months, which is by June, we should have about 150 public charging stations in Delhi. We know this will not give us returns immediately but as I said it is important for awareness, it is important for people to not have range anxiety. We are talking to at least five more cities to develop similar infrastructure. And we hope that we increase this and, with the FAME 2 coming up, many more such initiatives will be underway in large parts of the country.

*Interviewer:* At the MOVE summit, you spoke about the convergence of battery storage and EVs, which brings me to my next question – how will battery storage alter the transport and electricity sectors of the country? And where does India stand in this technology at this point?

*Mr Kumar:* Well, I will speak about why convergence and why it is absolutely essential for what India is doing. The renewable energy integration in the country is growing in leaps and bounds. By 2022, we expect 175 GW of solar and wind energy to be installed in the country. Now this means that about 20-25% energy will only come from solar and wind - i.e. infirm power. Therefore you need some mechanisms to balance the grid. E.g. If solar power suddenly goes out you need something else to come up. What is that something else – these are co-ancillary services. Worldwide they are classified into three forms based on the response time. The first is the primary ancillary service which comes

up within 30–60 seconds and can only be done via a battery storage or pump storage plant (hydro). The second is a secondary ancillary service where you know in advance, say 15 minutes in advance, that 10000 megawatts of solar will not be there – for which decentralised gas based engines can be used. And the third when you are aware and you have forecasted that the next day you are going to have a short fall, you can ask the thermal generator. As the grid becomes peakier, as is happening in India, and renewable energy goes up, we cannot manage without primary ancillary services. And I am saying this based on the analysis of the Central Electricity Regulatory Commission (CERC) and CEA's assessment that by 2030 India will need at least 25 GW of primary and secondary reserves. Why I am saying convergence is that if you look at the cars or the buses that are going to come onto Indian roads, these will have very high load- battery sizes from say 50 kWh to 200 kWh. If you connect them to the grid, there is always a chance that the localised grid may not have the capacity to take that load. So if you have a battery storage based charging system, it can do many things. It acts as a protective shield preventing a big load to the grid. Obviously it can charge the EV and third it can provide ancillary services. Fourth it can do a host of other demand response services. So from an investment point of view, if I am investing in battery storage today it is very, very expensive. I may not have a business model, but the moment I have 3-4 different stacks of revenues, it becomes a very different proposition. So the reason I am saying convergence is if you promote this you not only put in place a charging infrastructure but you also serve a host of other pressing requirements of the sector - primarily the ancillary services.

As far as technology is concerned, honestly speaking, there is no battery manufacturing in the country at the moment. But only last week a very ambitious mission has been launched by the government, of nearly USD 40 billion, for transformative mobility and energy storage. And I think it's a step in the right direction where 'Make in India' for these batteries systems is being promoted. As I mentioned 25 GW is a very large market and this doesn't include the EV market that we are looking at, which is almost 100-115 million cars by 2030. So by putting together a good policy and regulatory ecosystem, the government hopes to get a large number of battery players into the market as quickly as possible.

*Interviewer:* What do you think is the role of research organisations like WRI in advancing electric mobility in India?

*Mr Kumar:* I would say enormous. We are at a stage where we are just beginning and there are many countries in the world where a lot of experimentation has happened and a lot of policy mechanisms have been created. I talked about convergence, it is not being talked about for the first time – this exists in many parts of the world. Expert organisations like WRI provide inputs to key policymakers and regulators to take a look at new ways of establishing regulations. Because, in a very fast changing energy world, what is needed is fast changing regulations and I think that is where bodies like WRI, with the kind of expertise that you have, and with the kind of linkages you have with the best in the world, can provide a very strong impetus at the policymaking and implementation levels.

*Interviewer:* What are some of the important research questions that will be useful to take up at this point?

*Mr Kumar:* One, what should be the right business models for laying out public charging infrastructure? And it will not be one, it'll be many others. That's according to me the first one. Where should public charging infrastructure lie? India has taken 70 years to build 57,000 petrol stations but we may require 5,00,000 charging stations in the next few years. So that's another thing - where will these charging stations be put up? What are the expectations of investment returns from the land that you take from whosoever? Today the municipal bodies charge an enormous fee from the petrol pumps. So that is one set of questions that we possibly need to answer. The second is how do we create a policy and regulatory regime that incentivises continuously the adoption of EVs – starting from two and three-wheelers. Third, how do we promote shared mobility in a very large manner to really propel EVs. Fourth, can there be some disincentives for users of ICE vehicles in the form of a carbon tax which can actually promote EVs on a continuous basis. And of course, what kind of outreach and awareness will be needed - and India being a very large country, the awareness campaigns have to be attuned to the regional context. So these are key questions that come to mind.



## UPDATES FROM THE WORLD

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### **Toyota's electric vehicle programme is on overdrive** | *Market Development*

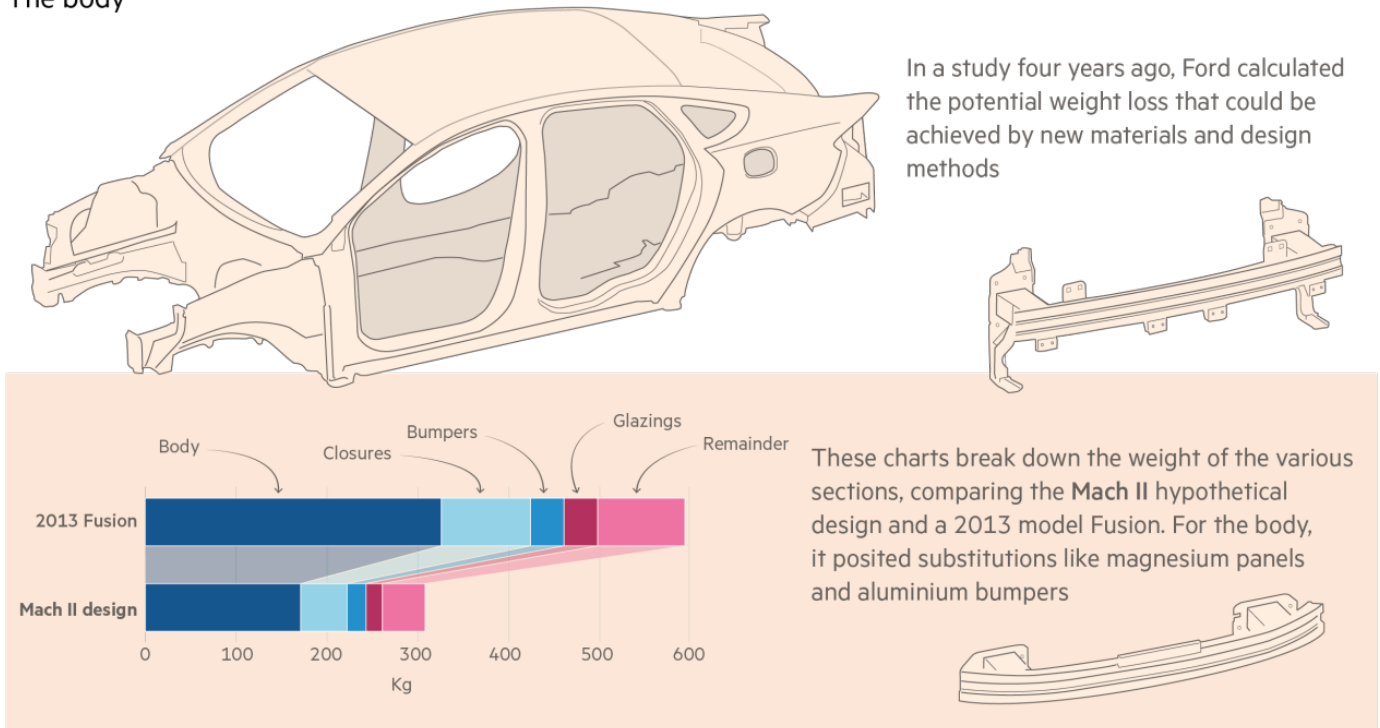
Toyota plans to get half of its sales from EVs by 2025 in a bid to speed-up its electrification timeline. The biggest hurdle however would be sourcing for battery cells in the numbers required and Toyota is looking to Chinese cell producers to help fill its needs. Simultaneously the company is working to improve lithium-ion chemistry to make it less rare-mineral intensive and plans to bring solid-state battery technology to the market. Having said that, Toyota still believes that fuel cell technology is the future of zero-emissions vehicles and will continue to develop it.

*Takeaway for India:* There are two precise takeaways for India: 1. While India is at the cusp of giving a big push to road transport electrification, through EVs, it is imperative to investigate ways that would make EVs affordable for Indian consumers to ensure faster adoption. This could be done by bringing down the battery cost through innovations and collaborations. 2. India should also look beyond battery cells and start exploring opportunities for introducing fuel cell technology to the domain of electric mobility. [Read more](#)

### **How to lightweight a car – in charts** | *Market Development*

“Lightweighting” a car has a positive impact on the fuel efficiency of a car. This is particularly important in the case of electric vehicles since lithium-ion batteries are often heavy weighing 200–300kg or more. This would mean delivering parts and components that weigh less without compromising on the structural integrity of the vehicle. In an industry that operates on thin profit margins, the challenge would be to produce better performance at a cost that does not make the final product too expensive. US car manufacturer Ford, in 2015, decided to opt for aluminium for its model F-150 pick-up truck. This eventually became America’s best-selling car. The low density of aluminium can lead to weight savings of up to 50%, although it is not as easily welded as steel. The major barrier for this adoption is cost as aluminium is three times more expensive than steel. Similar is the case with carbon fibre composites which provides high strength-to-weight ratio - demonstrating stiffness, corrosion resistance and the ability to be worked into complex shapes. Company like BMW introduced the first mass-produced passenger car with a frame and panels made of carbon-fibre reinforced plastic in 2013. Drawbacks include the difficulty in recycling composites, as well as the large amounts of energy that go into making them.

## The body



US Department of Energy/Ford/Magna 2015 study  
© FT

**Takeaway for India:** In this, lightweighting reduces the kerb weight of the vehicle. Lighter vehicle requires less power and hence less fuel to move. Therefore, lightweighting increases fuel efficiency which reduces the total cost of ownership for the consumer – a benefit the Indian consumer accords high value to. Lightweighting is one of the key strategies to make electric vehicles more affordable. [Read more](#)

## Electric vehicle push in Norway could add USD 1.3 bn to power bills by 2040 | Policy and Strategy

Norway's power grid would require an upgrade to the tune of USD1.27 billion over next 20 years if it intends to meet the demand from the country's growing fleet of electric cars. EV sales in Norway reached a record-high in March, with almost 60% of new cars sold being fully electric. In case of no actions, the grid cost will be paid by all consumers. Electricity consumers would face rising costs as a separate EV charging tariff appears unlikely. State-appointed consultancy firm, Poyry, estimates that there will be about 1.9 million electric cars by 2040 with a combined annual power need not exceeding 5 terawatt hours (TWh).

**Takeaway for India:** The Government of India is currently giving a major push to electric vehicles in India. The push is not limited to public transport but also plans to integrate commercial two-wheelers and three-wheelers. Like Norway, the grid in India would also require appropriate planning in order to meet the surge in demand. The Power Grid Corporation of India (PGCIL), along with state load dispatch centres, should be included in the entire electric mobility dialogue so as to better prepare the Indian grid for the anticipated electricity load from electric vehicles.

[Read more](#)

## **EESL, Ahmedabad civic body ink pact to develop EV infra** | *Market Development*

Energy Efficiency Services Ltd (EESL) recently entered into a Memorandum of Understanding (MoU) with the Ahmedabad Municipal Corporation (AMC). Signed on World Environment Day 2019, the MoU seeks to fast-track the adoption of e-mobility in Ahmedabad by establishing the infrastructure for EVs over a period of 10 years. EESL and AMC will jointly work to install 100 public charging stations across the city. EESL will bear the investments pertaining to services, along with operations and maintenance (O&M), while AMC will be responsible for the infrastructure space and required power connections - which includes load sanction and meter connections. AMC is expecting to prevent 4.46 tonnes of CO<sub>2</sub> emissions per e-car per year. [Read more](#)

## **Uber, Ola may have to make 40% of vehicles electric by 2026: Report** | *Policy and Market Development*

Taxi aggregators like Uber and Ola will have to start converting their fleet as early as next year to achieve 2.5% electrification by 2021, 5% by 2022, and 10% by 2023 before hiking it up to 40% by April 2026. One of the key recommendations that emerged from a recent inter-ministerial committee was that all new cars, sold for commercial purposes, should be totally electric from April 2026. Motorcycles and scooters sold for commercial purposes, such as those used by food delivery services and e-commerce companies, will also need to be completely electric from April 2023. [Read more](#)

## **Modi government's big electric vehicle push** | *Policy and Strategy*

The Ministry of Road Transport and Highways is working on a draft notification proposing to ban all ICE powered vehicles in India - starting 2025 for two-wheelers and 2023 for three-wheelers - in an effort to curb pollution. Government think-tank Niti Aayog will allocate more funds once the ₹10,000 crore allocated to the FAME II scheme gets utilised. The Green Urban Transport Scheme (GUTS), launched by the Ministry of Housing and Urban Affairs (formerly Ministry of Urban Development), aims to reduce public transport carbon emissions by proposing a ₹250 billion grant to develop electric vehicles for public transportation. Several states are also supporting this initiative as they are currently working with electric bus manufacturers such as Ashok Leyland, Goldstone Infratech, Tata Motors, JBM-Solaris and BYD to electrify state public transportation. [Read more](#)



## **EV @ WRI**

### **8 years watching and influencing urban transformation: Reflections from a foundation program officer**

*By Margarita Parra*

City landscapes have, and will continue, to adapt to waves of innovation such as those created by autonomous vehicles. This will likely lead to a complete rewiring of streets and modes of transportation. This article discusses the need to “ride the wave” of new developments, look around the corner, and make the case for new policy and new approaches to advocacy that enhance the new paradigm that the world is entering into. The article also touches on new mobility options, the rise of electric vehicles and whether cities are doing enough to catch these waves to their benefit. [Read more](#)



# EV FEATURE

## ELECTRIC TRANSPORT REVOLUTION SET TO SPREAD RAPIDLY INTO LIGHT AND MEDIUM COMMERCIAL VEHICLE MARKET

*This article was first published in BloombergNEF | May 2019*

London and New York, May 15, 2019 – Electric vehicles, or EVs, are on track to dominate global sales of passenger cars and buses by 2040, and to encroach significantly on the market for vans and short-distance trucking, according to the latest forecast from research firm BloombergNEF (BNEF).

Based on analysis of the evolving economics in different vehicle segments and geographical markets, BNEF's Electric Vehicle Outlook 2019 shows electrics taking up 57% of the global passenger car sales by 2040, slightly higher than it forecast a year ago. Electric buses are set to hold 81% of municipal bus sales by the same date.

For the first time, BNEF has incorporated in its forecast detailed work on the commercial vehicle market. These projections show electric models taking 56% of light commercial vehicle sales in Europe, the U.S. and China within the next two decades, plus 31% of the medium commercial market.

Heavy trucks will prove the hardest segment for electrics to crack, with the latter's sales limited to 19% in 2040. Their use case will mostly be in shorter-distance applications. However, conventional heavy trucks on long-haul routes will also face other, non-electric competition – from alternatives using natural gas and hydrogen fuel cells.

Colin McKerracher, head of advanced transport for BNEF, commented: "Our conclusions are stark for fossil fuel use in road transport. Electrification will still take time because the global fleet changes over slowly but, once it gets rolling in the 2020s, it starts to spread to many other areas of road transport. We see a real possibility that global sales of conventional passenger cars have already passed their peak."

The role of shared mobility services such as ride-hailing and car-sharing will be important in this evolving picture. These services account for less than 5% of all passenger miles travelled globally at the moment, but this is set to rise to 19% by 2040. The BNEF team does not expect autonomous driving to have an impact on global transport and energy patterns until the 2030s.

Ali Izadi-Najafabadi, who leads BNEF's coverage of shared mobility, said: "Providers of shared mobility services will choose to go electric faster than private individuals. There are now over a billion users of shared mobility services such as ride-hailing globally. These services will continue to grow and gradually reduce demand for private vehicle ownership."



The main driver for the electrification trend over the next 20 years will be further sharp reductions in EV battery costs, making electric cars cheaper than internal combustion engine (ICE) alternatives by the mid-to-late 2020s in almost every market, on the basis of both lifetime costs and upfront costs. Since 2010, the average cost of lithium-ion batteries per kilowatt-hour has fallen by 85% on a mixture of manufacturing economies of scale and technology improvements.

The BNEF report sees China continuing to lead in electric cars, accounting for 48% of all passenger EVs sold in 2025 and 26% in 2040 when other markets are catching up. Europe pulls ahead of the U.S. as the number two EV market globally during the 2020s. Electrification in non-China emerging markets will be much slower, leading to a fragmented global auto market.

The aggregate increase, however, will be impressive. BNEF expects passenger EV sales to rise from 2 million worldwide in 2018 to 28 million in 2030 and 56 million by 2040. Meanwhile conventional passenger vehicle sales fall to 42 million by 2040, from around 85 million in 2018. Policy support such as fuel economy regulations and China’s new energy vehicle mandate are expected to drive the EV market in the next 5-7 years before economics takes over the latter half of the 2020s.

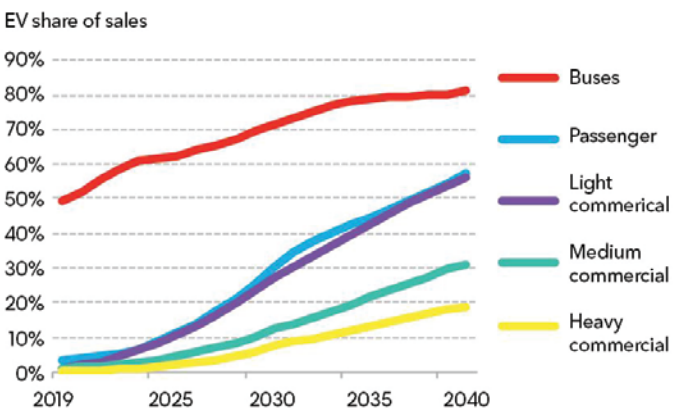
The oil, electricity and battery industries will all be impacted by the rise of EVs. A year ago, BNEF estimated their impact on road fuel demand at 7.3 million barrels per day by 2040. However, it has now nearly doubled this to 13.7 million barrels per day, partly because of new forecasts for electrification of the commercial vehicle sector and partly, paradoxically, because ICE fuel efficiency is expected to proceed more slowly than previously thought. That means that every EV displaces a conventional car that would have used a greater quantity of road fuel.

BNEF now estimates that EVs will add 6.8% to global electricity consumption in 2040, and that they will drive a surge in EV lithium-ion battery demand from 151 gigawatt-hours in 2019 to 1,748GWh in 2030. New mining capacity for all battery materials will need to come online to avoid this causing a supply crunch.

McKerracher said: “Transport is moving into a period of disruptive change, with many different factors coming into play. We have incorporated several new elements into our analysis, including an updated EV cost model that includes the cost of a home EV charger to reflect more accurately the costs individuals face to go electric; and a battery chemistry forecast for each of the new segments covered in this year’s report.”

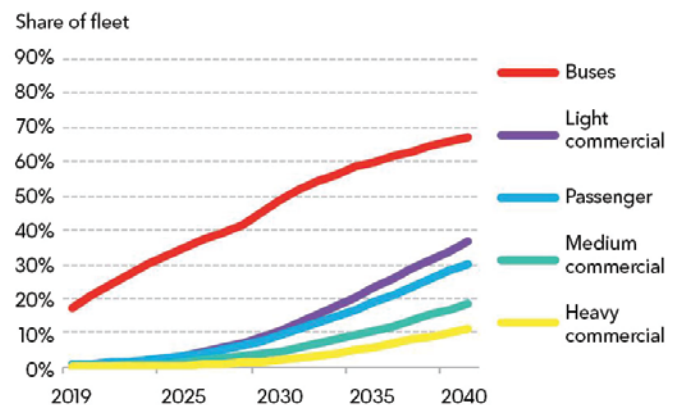
Despite the radical changes afoot, the outlook for road transport emissions remains far from rosy. The BNEF team sees the size of the global on-the-road conventional passenger car fleet continuing to grow until 2030. This means that road vehicle emissions will continue to rise for the next decade, followed then by a sharp fall in the years before 2040, which will only return them to levels similar to 2018.

### EV share of annual vehicle sales by segment

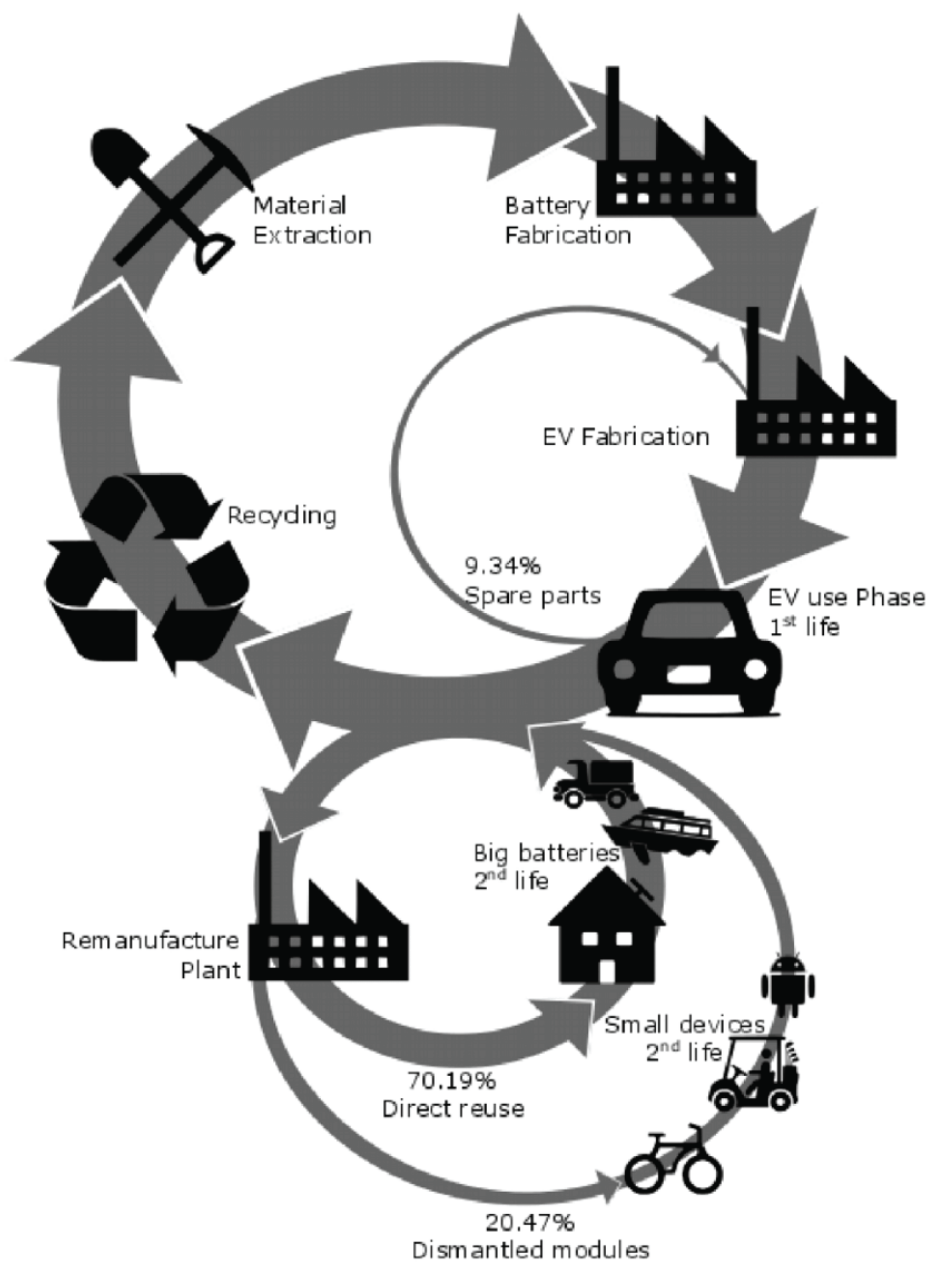


Source: BloombergNEF. Note: Passenger car and bus figures are global. Commercial vehicle segment adoption figures in both charts cover the main markets of China, Europe and the U.S.

### EV share of vehicle fleet by segment



Source: BloombergNEF. Note: Passenger car and bus figures are global. Commercial vehicle segment adoption figures in both charts cover the main markets of China, Europe and the U.S.



## Schema of the circular economy paths

Source: GRAPHIC by Lluç Canals Casals

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**Video Courtesy:** [https://youtu.be/QLxiXX\\_IGY](https://youtu.be/QLxiXX_IGY)

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