



THE EUROPEAN FILES

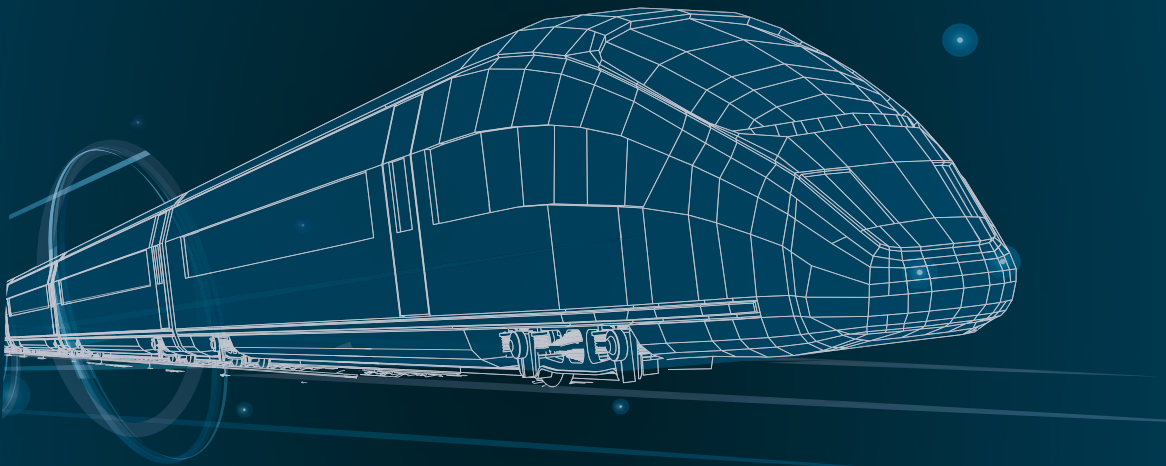
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Towards Safe, Connected and Clean Mobility in Europe



MOVING EUROPEAN RAILWAY FORWARD

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EDITORIAL

TOWARDS SAFE, CONNECTED
AND CLEAN MOBILITY IN EUROPE

Nowadays, transport accounts for more than a fifth of CO₂ emissions and 33% of energy consumption in Europe; as such, it is the main source of air and noise pollution in our cities. A particular focus has to be made on road transport sector, which contributes up to 75% to the overall EU transport pollution.

The International Energy Agency (IEA) predicts that greenhouse gas emissions from transport will increase by 120% between 2000 and 2050.

The automotive sector is a driving force of the European economy, which will have to adapt rapidly and find ways to increase its efficiency through battery, digitisation and automation technologies that will offer great opportunities to meet the challenges it faces and strengthen competitiveness at global level.

Battery capacity is a key element of tomorrow's transport systems. The European Battery Alliance, launched in 2017, fosters real synergies across the battery value chain in Europe.

A strategic action plan for batteries was launched in 2018, covering investment, standards, research and innovation to create a strong industrial base for batteries in Europe.

The Commission will invest €200 million in developing and producing the next generation of electric batteries.

To ensure the successful transition, the Commission understands that it requires an update in transportation infrastructure as well as a renewal of industrial capacity. Infrastructure that responds to the emerging needs of electric cars will benefit road safety, urban mobility and the citizen's sustainability impact.

The European Commission's recent initiatives aiming at improving the transport sector's emission performance by setting performance standards for cars, vans and heavy goods vehicles culminated in a Regulation following an agreement between the Council and the EU in December.

An action plan for a wider use of alternative fuels such as biofuels is also a key element in the decarbonisation of the transport sector.

Hydrogen also offers a clean alternative to electrification for hydrogen trains and fuel cell electric vehicles.

The development of several major intermodal infrastructure projects (rail and sea) is underway and can provide solutions to reduce our carbon footprint and help decongest transport in our cities.

New mobility models will require a safer, smarter, multimodal, inclusive and more efficient approach. This means using data-driven analysis to serve the public and minimize stress at all levels. Whether with

smarter infrastructure or greener metering, the integration of sustainable solutions across modes of transportation is integral to the reimagining of mobility across Europe.

The transition to clean mobility requires a strong and targeted policy response based on agreed economic standards and instruments in order to benefit from industrial opportunities for the jobs of tomorrow.

Most European citizens want cleaner and smarter means of transport in line with the ongoing energy transition.

This issue of the European Files seeks to highlight the opportunities for growth in the mobility sector and the establishment of an eco-system of mobility infrastructures in Europe that will secure Europe's leading position in future global competition.

Editor-in-Chief
LAURENT ULMANN

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Tomorrow's mobility and European energy sovereignty



Maroš ŠEFČOVIČ

*Vice-President and Commissioner for Energy,
European Commission*

As hard as it is to believe, the electric car was invented (in Europe) almost 200 years ago. It even became quite popular early into the 20th century but it quickly lost its primacy to the combustion engine, which was able to drive longer distances using the newly discovered 'black gold' of the time. It took us many decades to understand that that petrol was more black than golden; that it had tragic ramifications over our air quality and CO₂ emissions. Today transport is responsible for over a fifth of Europe's CO₂ emissions and is the main source of pollution in our cities. It is therefore the cause of diseases and premature deaths of millions around the world every year.

That is about to change. We are witnessing increasing pressure from citizens, civil society, and decision-makers at all levels (with cities paving the way) who are rightfully demanding cleaner, smarter, and future-proof means of transport, matching the energy transition of the 21st century. The EU is a major player in this transition and we are playing our role for ensuring this transition is changing gears.

Last year, the Commission tabled a proposal for new CO₂ emission performance standards for cars and vans, and later for heavy-duty trucks. In 2022, we foresee extending this approach to buses. We also presented an Action Plan for alternative fuels infrastructure brings an additional EUR 800 million in

innovative financing. This is a large amount but the purpose is not to finance 'anything'. Our infrastructure needs to be "future-proof", ready for large-scale uptake of low- and zero-emission vehicles.

Finally, we are therefore working closely with Member States on implementation of their national policy frameworks for alternative fuels. Yet, there we must increase our ambition if we are to meet the challenge. For example, currently, there are 130,000 publicly accessible recharging stations across the EU. This is enough for the time being for the 700,000 vehicles on the road but it will not be enough in 1-2 years' time when we expect accelerated take-up. We will look at this in our 2019 evaluation of the Alternative Fuels Infrastructure Directive.

This is the big moment of Europe's automobile industry to take off the gloves and embrace the challenge. Let us all recognise that the potential is huge! According to the International Energy Agency (IEA), the global number of electric vehicles should triple over the next two years. The IEA expects sales to increase by 24% each year on average up to 2030. That is 125 million new electric cars!

That is why clean transport is not one option out of many. It is the only option. The only question is who will be the one to provide the best, most effective, most sustainable and competitive solutions. The question is whether Europe would produce the solution or will we have to buy it from others. Last year, the absolute majority of new electric cars sold were in China. More than 90% of all electric buses run in China. Few other countries in the world have developed such market shares.

Ensuring a leading competitive position in this fast evolving market will not be easy. We will now have to accelerate in order to catch up and overtake the current market leaders of clean cars (namely China and California). Yet, while the other market players have been advancing fast, they haven't advanced very far. They are still bound by one critical component: the capacity of the battery.

The major scientific breakthrough in batteries is therefore still ahead of us. The 'prize' for making it will be gigantic: the battery

market will soon reach an annual turnover of €250 billion in Europe alone. This is a perfect example of where Europe can plug in. That is why we created a European Battery Alliance in 2017. In just over one year of its existence, the Alliance has already shown its creativity and agility, creating new synergies across Europe and across the battery value chain. This will allow Europe's electro-mobility industry to go the extra mile, or many extra miles. Our initiative is aimed at producing 'green batteries', which will be sustainable all across their value chain, or ideally value cycle...

The race for clean mobility is going to be a difficult one, requiring many stakeholders to work together and reinforce each other towards our common goal. Although the mandate of the current Commission is about to end, I have no doubt the EU will carry on its commitments; creating incentives, policy, regulation and support for this cause. I do not underestimate the challenge, which is still required from our entire industry in order to create this transition but I am convinced that given what is at stake, we simply cannot afford to miss this race. If Europe was the first to produce electric cars and if Europe has been leading the combustion cars industry for a century, it is time we now do both: produce the best clean cars in the world!

Foster market uptake of zero emission cars with seamless charging infrastructure and high-quality batteries produced in Europe



Elżbieta BIENKOWSKA

Commissioner for Internal Market, Industry and SME's, European Commission

The automotive sector is a powerhouse of the European economy. It is a major employer, not only in the manufacture of cars, but also in the service jobs it creates. But it faces major challenges. Its products are associated with air pollution in our cities and with climate change. Public confidence was badly shaken by the Dieselgate scandal. Around the world, competition is getting fiercer and new players are emerging to challenge Europe's leadership. If Europe is to retain its leading position, the industry must adapt, and adapt rapidly.

The way ahead is already clear: after dominating for more than a century, the internal combustion engine in the upcoming years has to be consigned to the museum. We cannot move around, particularly in crowded cities, leaving behind a trail of noxious gases and accelerating climate change. The future of transport must be zero emission. We have the technical solutions to make this happen, but for it to happen in reality authorities on different levels and industry must work together.

Just few weeks ago, the Commission adopted a long-term strategy to create a climate neutral economy by 2050, by investing in innovative and realistic technological solutions and by supporting research and improving access to finance. But we cannot afford delay. Around the world our competitors are investing in key technologies for the cars of the future.

We cannot allow ourselves to be left behind in the manufacture of components which are vital to the zero-emission vehicle of the 21st century. That is why we have already created the European Battery Alliance.

But before we talk too much about the technology, we must think about how we will get from today's situation where nearly every vehicle on the road is fossil-fuel powered to a future where zero-emission vehicles are the norm in a very short period of time. Who will build these vehicles? How will people be persuaded to buy them? Where will they refuel? It's a chicken and egg problem, and that is why authorities have to play a catalytic role in overcoming the difficulties of transition.

The Commission proposed a framework for achieving clean mobility in 2017. This sets ambitious CO₂ targets for 2025 and 2030, but leaves choice of the technology open. Thus industry has both the incentive to make innovative steps and the time to adapt. Incentives cover zero-emission vehicles, such as battery electric or fuel cell vehicles, and low-emission cars – mainly plug-in hybrid vehicles equipped with fossil fuel and electric motors.

So why are we still supporting the development of vehicles that burn fossil fuels? The answer is simple: we live in the real world, where we cannot achieve such a massive change overnight. The millions of vehicles on the road today will continue to circulate for years to come – it would be environmental and economic madness to scrap them all now. We have millions of skilled workers who need retraining to produce the new generation of vehicles. Neither industry nor society is ready for a big bang approach, but at the same time we have to make sure that we will be able to adapt to the ever-changing reality.

Hybrids also help address the transitional infrastructure problem. Recharging is a major concern for anyone contemplating buying a fully electric vehicle, but as hybrids become more common, there is an economic case for building more charging stations, which makes the choice of an all-electric vehicle more attractive. And of course the batteries that power a plug-in hybrid can also be used in all-electric cars. It's win-win.

But we don't expect the market to work its magic instantly. The Directive on the deployment of alternative fuels require EU Member States to kick-start the rollout of the alternative fuelling infrastructure. Coordination at the EU level is essential if citizens are to drive across borders.

Which brings us to the most important element in the transition: the citizen. Public concern about global warming is rising, while the health hazards of particle emissions have been in the spotlight since the beginning of the Dieselgate scandal. Many people want to change to emission-free vehicles. But they will not be coerced to do so by what are seen as punitive measures. We need to show that there is a clear path forward. We need carrots, not sticks.

I said at the beginning that the automotive industry is a key element of our economy. But in the car of the future, the most high value element will be the battery. The race to develop powerful, lightweight and durable batteries is already on, and Europe has been a late starter. We need action to catch up with manufacturers, particularly in Asia, who look set to dominate the market. Battery technology must be developed in Europe, if we want to remain a global leader in the automotive industry. We must do everything in our power to be able to still drive European cars in ten or twenty years from now.

This is why the Commission, together with Member States and industry stakeholders, launched the European Battery Alliance in October 2017, followed by the Strategic Action Plan for Batteries in May 2018. The Action Plan covers all aspects, investment, research raw materials, skills, standards – everything needed for a globally competitive battery industry.

Concrete results are emerging. For instance work has already begun on a demonstration line in a project led by Northvolt of Sweden (with a €52.5 million EIB loan), while Umicore will invest in Poland's Nysa to produce cathode materials.

We know where we want to get, and we have planned our route to get there. Now is the time for concerted action.

Towards safe, convenient, affordable and environmentally friendly mobility in Europe



Andreas SCHEUER

German Minister for transport and digital infrastructures

3.2 billion kilometres – that's the distance Germans travel everyday. A distance of 39 kilometres per person. The situation in other EU countries is comparable. There too, people drive many kilometres every day – for work, shopping or sports. Delivery services bring pizzas or parcels. Trucks provide businesses with necessary supplies. The journeys, however, are not only national ones. Workers commute across borders and families travel south on holiday. French people order products from Poland and vice versa. Trucks, cars, trains, ships, and planes are permanently crossing our continent. The whole of Europe is on the move – but this mobility is gradually reaching its limits.

Anyone in doubt need only turn on their radio: Traffic jams reports are getting longer. Accidents seem to be happening more often. Trains are running late and there are endless queues at the airports. All of this costs time, money, energy and nerves. This is complicated by the fact that all forecasts predict that traffic will increase even further. Even more people want to travel, even more goods need to be delivered.

It is our responsibility to make this mobility possible in the future – while ensuring that it is safe, convenient, affordable and environmentally friendly.

It is a challenge; but we have everything at hand to tackle it.

Technological progress will bring cars that need less fuel and hopefully produce

zero emissions soon. It helps that trains will consume less energy, planes less jet fuel, that ship engines will get cleaner and that air taxis will, quite possibly, soon be an everyday sight.

But some of these developments will take time. More time than we have. This is why it is great that one thing speeds up these matters massively – the digital revolution. Going digital makes an entirely new type of mobility possible – much more flexible and environmentally friendly than, for instance, a car could ever be. Mobility without the problem of searching for a parking place or a filling station. Digitalisation interlinks different transport modes and offers tailored solutions for individual users.

It provides solutions not only for passengers but also for freight transport. With its help, goods can be picked up, loaded and delivered in a tailor-made manner.

The objective must be to integrate all transport modes using their advantages and interlink them when it makes sense. Thereby, we can make the whole transport system more efficient and environmentally friendly.

This becomes clear in the project of shifting more traffic from roads to railways.

In Germany, we would like to double the number of railway users by 2030. This applies to long-distance, freight and local services. To this end, we are expanding the network in a targeted manner and remove bottlenecks. We are promoting combined transport and gradually equipping lines with the European ETCS signalling system. With this measure alone, 20 percent more trains can operate. We also need modern technology across borders. It is not acceptable that a train from the port of Hamburg to Genoa needs a new locomotive at both the Swiss and the Italian borders because it is unable to process the signalling technology of three different countries.

With all of these measures we are making it easier to switch to rail. All of Europe benefits from this, because Germany is a transit country.

The enormous potential of digitalisation and connectivity also becomes clear in city centres. Here, the problems are most serious. All over Europe, cities have to face the same challenges: too many distribution operations and commuters, a lack of parking spaces and poor air quality. There are many approaches to relieve the pressure on roads.

One example is local public transport. Apps make it possible to find out departure times, routes and charges with only a few clicks.

Thanks to new schemes including electric scooters or car sharing services, buses, trams and underground trains can be perfectly interlinked with other means of transport. The more convenient local public transport is, the easier it is to leave your own car at home.

Another example is distribution. Journeys can be optimised and coordinated digitally. It is hard to understand why one address in the city centre is served by different parcel services up to five times a day – instead of combining these operations.

Finally, there is the car. More than half of all citizens claim that they would never give up their car. A third say that it is "very difficult to imagine". So what can a car – besides clean drivetrains – contribute to modern mobility? A lot!

First of all, there is automated and connected driving. This will significantly reduce the number of accidents. Cars and trucks will warn each other of congestion or black ice. With the help of artificial intelligence, and better than a human driver, cars and trucks will predict what other road users will do next. And they will react more quickly. Also, they will be more environmentally friendly since they will make a smooth flow of traffic possible. Germany is a pioneer in the field of automated and connected driving. We set up the first digital test beds, on which businesses can test their innovations; even across borders together with France and Luxembourg. It is obvious that automated and connected driving cannot stop at national borders. Europe must cooperate closely.

But it is also obvious that if, in the future, everybody simply replaces their former car with a highly automated one, this would not bring much benefit. We must reduce the number of vehicles with only one passenger. Digitalisation makes it possible. We are promoting pilot projects in which different users' journey requests are dovetailed. Such ride sharing and on demand services offer new opportunities for practical and affordable mobility.

All of this shows that technological progress, digital solutions and smart connectivity will enable us to cope with the growing flows of traffic. The wish for safe, connected and clean mobility is not for the distant future. It is possible. And we will enjoy it!

Challenges of connected mobility and autonomous vehicles



Anne BERNER

*Minister of Transport and Communications,
Finland*

Automation is shaping the future of transportation. The utilisation of technology and automation is a key factor in increasing the levels of sustainability, efficiency and safety in transportation. To ensure the seamless functioning of connected mobility and autonomous vehicles, Finland is aiming for global interoperability.

The progress of automation is also an essential way to promote the European Union's competitiveness as a part of the global data economy and development path for AI (artificial intelligence). Automation and highly developed algorithms not only improve the safety and efficiency of transport, but also facilitate the achievement of climate and security goals in all different forms of transportation. Finland has committed to halving its transport emissions and road fatalities by the year 2030. In the long term, the aim is to achieve a level of zero.

To achieve the aforementioned goals, it is essential to develop autonomous transportation, particularly when it comes to questions concerning data and security. It is vital to strengthen the practices of human-centered data management and ensure the transparency of algorithms. Authorities must be provided with the criteria used in the decision-making of the vehicles' automated driving system. Understanding the functioning of algorithms enables authorities to regulate and

influence them. Transparency also increases the level of trust among road users.

Finland is working towards connected and autonomous driving and strongly believes that it will contribute to cutting emissions, providing better mobility services and enhancing safety when developed with close cooperation with the public sector, cities and industry. For cities, automation offers huge possibilities but also requires incorporating the work towards integrated autonomous mobility proactively into strategic planning, land use and operational models for transport services.

As for connected and automated transport, Finland is aiming for a transport system that supports fully autonomous transport. However, there are still questions that require solutions. For one, it is essential to ensure the level of safety in automated transport. This includes both road safety and data security. Data should be made accessible with fair, reasonable and non-discriminatory terms – there should be a discussion on how to draw the line between business secrets and shareable data. Data can be utilised in multiple ways, so it is also essential to find practical solutions to facilitate user rights. Furthermore, interoperability in legal and technical solutions as well as general acceptance are matters that need to be reconciled with the previously mentioned aims.

Viable business models are a key factor in the large-scale roll out of new technologies such as automation. Therefore, automated mobility goes hand in hand with the servitisation of transport. Finland's Act on Transport Services aims to create favorable conditions for the introduction of new technologies, digitalisation and new business concepts in the transport sector. The Act requires service providers to open the data on their services to any third party, including competitors. By dismantling the aforementioned market barriers, it is also possible to encourage the creation of new business models that blend and merge different transport models and vehicles and go even beyond the transport sector. A similar approach has also been taken to regulate the data to be provided for infrastructure and traffic management purposes, which is key enabler and directly improves the level of road safety of connected and automated driving.

Finland aims to be home to the world's leading centers of expertise focusing on intelligent automation in the transport field. For example, Finland has a strong and dynamic maritime sector and the industry has established an autonomous maritime ecosystem. This cooperation involves more than 80 industry partners and has Government support. The work has already resulted in world's first autonomous shipping solutions. As for unmanned aircrafts, it can be mentioned that our liberal legislation promotes a risk-based approach and the responsibility of the aircraft operator, which has encouraged multiple providers to pilot their services in Finland.

Ensuring that the utilisation of data processing and artificial intelligence takes place at a safe and ethically sustainable level requires legislation at the national, European Union and international levels. Finland is committed to having a strong influence on the revision of international legislation in order to enable autonomous driving and shipping, and, above all, to ensure its safety. We also welcome the EU Commission's work towards responsible, user-centric and transparent AI that improves the competitiveness of the European economy and industries but at the same time delivers on our societal goals.

Governments are not responsible for technological or business development. However, it is crucial that they do their part by ensuring the possibility to be on the leading international edge of it. Legislators' responsibility is to enable the uptake of new technologies and innovations and to encourage experiments. Therefore, they should also aim towards a neutral and level playing field in order to facilitate competition and innovation for both technological development and operational models. In Finland, the development of telecommunications has shown that it is essential to allow the markets choose the winning technologies. With a similar approach, we believe that the transport sector will also find its own safe and clean winning ways.

Using new technologies means working together

The three lessons of the Experience Week



Cora VAN NIEUWENHUIZEN

Dutch Ministry of Infrastructure and Water Management

Experience Week

Mobility in the Netherlands, and in Europe as a whole, needs to be made safer, more efficient and more sustainable. Smart mobility can contribute to this goal, and truck platooning has great potential as a way of solving logistics issues. In 2016, when it held the EU Presidency, the Netherlands organised the Truck Platooning Challenge. An important lesson from that experiment – which I was involved in as a member of the European Parliament – is that ‘learning by doing’ is crucial when taking innovations to the next level. That’s why I’m delighted with the input of the participants in the Experience Week Connective Transport that took place in October 2018. During this week, government bodies, hauliers, shippers, retailers and truck drivers worked together to test a new logistics technique, in an experiment involving a platoon of 250 trucks from ten major logistics service providers driving through the Netherlands. The trucks were connected with each other, as well as with smart traffic lights that could detect convoys and let them through (the ‘green wave’ approach). But it’s about more than making better use of existing technology and data sharing. It’s about interdisciplinary thinking.

The challenges

We face huge challenges in the field of mobility and logistics. The economy is growing, and with it the demand for transport.

Which means more and more vehicles on the roads. That leads to ever greater congestion, longer journey times and less predictable arrival times. That’s not just extremely costly, it also causes greater stress among drivers, more dangerous situations on roads, more accidents and more victims. To say nothing of all the extra CO₂ emissions, which are bad for the environment.

Economic growth is expected to continue for the time being, and in itself that’s good news. But there’s another side to the coin: congestion will get worse. In fact it’s expected to double on certain corridors. So it’s time for new solutions. As Albert Einstein said: ‘We cannot solve our problems with the same thinking we used when we created them.’ So we’re looking at new approaches to mobility. We’re trying to find links with the digital domain and points of contact with other disciplines – a multidisciplinary approach. We innovate by combining ideas, knowledge and methods.

Initial results

As part of an overall smart mobility agenda, truck platooning represents an important pilot in testing the practicality of new technologies. The initial findings are interesting:

- *greater safety*: digital systems are 25 to 40 times more alert than humans;
- *better traffic flows*: when used for truck convoys, the ‘green wave’ approach results in 10 to 17% time gains;
- *sustainability*: some participants claimed to have used 6 to 14% less fuel.

Last but not least, truck drivers themselves were very enthusiastic. This new type of driving entails changes to the profession, new skills and challenges.

Lessons learned

What are the three main lessons of the Experience Week Connected Transport?

1. Using connected transport requires a more systematic approach. Smart mobility doesn’t begin and end with the haulier and the road. Instead it starts at the beginning of the logistics system: with the planners and shippers. It’s not just about enabling trucks to drive in convoy safely, smoothly and as continuously as possible. It’s also about ensuring that they

don’t incur unnecessary extra mileage, and that they drive at the right times. It sounds logical, but it requires a new mindset: a focus on freight itself, rather than on transport modalities.

2. The entire ecosystem needs to be taken into account. The initial experiences of the hauliers taking part showed that combining platooning with smart traffic lights can substantially cut fuel use. That will help local road authorities in their battle against particulate matter, and represents quick environmental gains in the cause of sustainability. And the great thing is, there’s nothing to stop us from prioritising a major roll-out of smart traffic lights linked to a corridor approach right now. We have the technology and we know it’s possible. First and foremost, it’s an organisational challenge that transcends the individual spheres of different organisations. An interdisciplinary approach in other words, based on an entire ecosystem of infrastructure and mobility.
3. Make ‘transport flow’ central. A chain is only as strong as its weakest link. So to optimise flow, it’s important that everyone joins in. Right across the system: from distribution centres to road authorities, from hauliers to supermarkets. By tackling the central goal as a collective issue, we gain much more in terms of safety, sustainability and efficiency. Four showcases were presented at the Experience Week in which all the relevant players were involved: government bodies, businesses, educational institutions and local communities. It taught us how important it is to chart the current state of goods flows, pinpointed problems in the corridor, and revealed how fragmented the organisation of transport processes sometimes is. By making the issue of transport central, it becomes a collective mission. And by focusing on specific European corridors, national borders are transcended.

Complex? Perhaps. Impossible? Certainly not. The success of smart mobility depends on basing our approach on new applications, with a focus on visible added value.

Norway and electric vehicles – a successful combination



Jon GEORG DALE

*Minister of Transport and Communications,
Norway*

No other country in the world has more electric vehicles per capita than Norway. It has a simple explanation – political willingness! Numerous benefits include less tax and user incentives, and abundant hydropower means that we can provide charging stations throughout the country. With many early adopters, Norway has been a frontrunner, and we see that politicians from many European countries look to Norway to learn and get inspiration for achieving similar results.

In Norway we have seen a steady growth in the sale of electric cars. The first financial benefits were introduced already in the early 1990s with the removal of the vehicle purchase tax for all electric cars. In 1996, an additional exempt from annual motor vehicle tax was announced, and from 1997 drivers of electric vehicles did not have to pay on toll roads. Free municipal parking was introduced in 1999.

Mainly because of new models and increased range, we have seen a tremendous growth in electric vehicles in Norway the last few years. Norwegians love driving to their cabins on weekends, and new electric cars are able to take us door to door without a fear of running out of battery power half way. Infrastructure for charging is also important. There are now more than 10 000 publicly accessible charging points in Norway. A dedicated app called Nobil from the Norwegian EV Association

makes it easy to see where they are and how many are in use at any given time.

In 2018, between 21.6 per cent and 45.3 per cent of all new cars sold have been electric vehicles. In September, the car with the most sales was the Tesla Model X, and Norway now has approximately 185.000 electric cars.

Norway has a clean power supply that is 98 per cent renewable, and we also use clean energy to heat our homes. This means that we do not have the same opportunity as many EU countries to reduce greenhouse gas emissions by switching from coal to more climate-friendly energy sources. The transportation sector accounts for 60 per cent of emissions from non-quota sectors in Norway, and cutting emissions within this sector is therefore the only way for Norway to comply with our climate commitments.

In addition to being environmentally friendly, owners of electric cars in Norway have many economical and practical advantages when driving. The exemption of purchase tax and VAT provides a large financial incentive for potential buyers of electric cars. As a result, a new Tesla has a price tag about the same as a new Audi or Mercedes. Local benefits, such as free parking on public parking spaces, no road toll, free access to ferries connecting national roads and mostly free access to public transport lanes have also been important. Local municipalities have influence over local benefits, but we have a national binding standard stating that fees for electric cars should not exceed 50 per cent of the fee for conventional cars.

Estimated to almost NOK 10 billion per year, it is no secret that all these benefits come with a substantial cost for the government. However, we see that it works, and that we can measure the success in fewer emissions in the environment. In fact, September 2018 marked a new low with 55 g/km – the lowest ever on record.

In 2016, the Norwegian government published its long term National Transport Plan. It has ambitious goals and states that by 2025 all new passenger cars and light commercial vehicles should be zero emission vehicles. Improvements in technological maturity, in a

way that zero emission vehicles will be competitive compared to conventional vehicles, is a precondition for the targets. We believe that technological development and political signals will be powerful drivers for the decarbonisation of our transport sectors.

In Norway, we see the rise of electric vehicles as one of many important measures to reduce climate emissions. Not by limiting mobility, instead we will reach our goal with political willpower, financial incentives, cooperation with industries and good infrastructure. A more “green” transport form is definitely within reach.

What European funding to support tomorrow's mobility (Juncker Plan)



Ambroise FAYOLLE

Vice President of the European Investment Bank

Financing innovation is one of the four priorities of the European Investment Bank along with financing SME's, infrastructure and climate change. As a result, we are clearly engaged, since many years, in funding the investments for tomorrow's mobility.

The mobility sector is currently undergoing profound transformations. Digitalisation, artificial intelligence and automation, connectivity and powertrain electrification are transforming the transport system and challenging its traditional features. Socio-economic trends, like the increasing urbanisation, the shared economy and the intense "digital lifestyle" of younger generations, as well as new entrants from the technology sector are contributing to accelerate the innovation and transformation of mobility and the automotive industry.

The automotive industry itself is at the centre of a convergence of initiatives involving electrified powertrain technologies, autonomous and automated driving technologies, increased digitalisation and vehicle connectivity enabling enhanced localisation and communication opportunities for vehicles and their users. This convergence is favouring the emergence of new business models to deliver improved and higher value-added services to travellers with reduced emission costs and improved journey time (e.g. better use of commuting time within an autonomously-driven and connected vehicle).

In parallel to higher investments in electrified powertrains (mild, hybrid and full electric vehicles), automotive original equipment manufacturers are stepping up investments in the field of automated and autonomous vehicle systems and new mobility business models relying on advanced connectivity and digitalisation technologies. In the medium-long term, this could lead to a paradigm shift from "the car as a product", as we know it today, to "mobility as a service".

Mobility operators (e.g. public transport operators and authorities) are also embracing more convincingly new powertrain technologies and introducing electric- and fuel-cell powered buses in their fleets. Other mobility operators (car-sharing companies or ride-hailing ones) and private fleet operators are stepping up the adoption of electric vehicles and in some cases considering the opportunity to adopt automated vehicles when regulation will make it possible.

But it is not a straight path.

Though governments, the industry and consumers more widely agree that vehicle electrification is necessary to achieve the lower and lower carbon-dioxide emission targets and reduce local emissions levels, particularly in metropolitan areas, there is still some uncertainty about the timing and level of adoption of electric vehicles in different regions, particularly by individuals and families. Consumers do not buy electrified vehicles just because OEMs introduce them in their offering. In the short term, electric vehicle sales have shown to depend on government incentives and subsidies. In the long-term their market penetration will be mostly dependent on the investments for deploying an integrated and wide recharging infrastructure and on the investments in and evolution of battery technology.

Similarly, assessing the future deployment and adoption of autonomous vehicles is ambitious because of the legal, regulatory, technology and customer acceptance issues still to be overcome. According to some research studies, registrations of vehicles with higher levels of automation (SAE levels 4 and beyond) could account for about 4 million units per year by 2030 (3-5% of new

registrations), but this number could significantly increase to over 8 million vehicles in a scenario of accelerated adoption or decrease to some 2 million units in a scenario of constrained adoption by technological, commercial and regulatory barriers.

This is a challenging context for us, with its share of uncertainty and risk. Still we can play a role and address suboptimal investment situations and market failures. The EIB can contribute, along with other public and commercial banks as well as investors, to support tomorrow's mobility: accelerate the development of innovative technologies, support the transformation of the industry (including the adoption of advanced and more energy-efficient manufacturing technologies, the upgrade of competences and skills) and the deployment of a more efficient, safer and sustainable European transport system.

As a public investment bank owned by the EU member states, the EIB must keep the best rating possible so as to benefit from the lower financing costs but it is also clearly committed to long term investment to stimulate European growth and jobs creation. This is why we are working on two sides: we are on the one hand lending to established manufacturers, suppliers and mobility operators – to support the industry transformation and employment in Europe- and we are also on the other hand financing new players, which are bringing more innovative and riskier technologies to market and piloting the adoption of new business approaches to address the emerging needs of the population and business actors.

The focus of EIB lending to support tomorrow's mobility, has in the last years mainly been on RDI, notably in the areas of electrification and alternative fuels, safety, light weighting technologies and innovative materials as well as on innovative technologies enabling improved vehicle connectivity, interaction with the infrastructure, automated and autonomous driving with the intent to sustain the shift towards a greener and safer mobility system. By way of example, the Bank's lending for projects linked to battery technology development and deployment accounted for over EUR 4.5 billions in the period 2010-2018. It included support to investments in energy storage technologies, advanced materials,

electrification and charging infrastructure, battery cells and systems, electric bus deployment. In particular, the European Commission has declared the development and production of batteries a strategic imperative for Europe for the clean energy transition and the competitiveness of the automotive sector. It has launched in 2017 the “European Battery Alliance” cooperation platform, with which the EIB has also engaged, aiming at putting Europe on a path towards leadership in the lithium-ion battery industry. In this industry, Europe is lagging behind Asia and starts from a smaller manufacturing basis. However, it is not necessarily at structural disadvantage versus Asia. The main factors of competitiveness are linked to access to raw and active materials, cost of financing, the right choice of lithium-ion battery chemistry mix and the mastering and optimization of highly complex process steps.

The challenge for the European players is therefore to seize now the window of opportunity to step into large-scale battery manufacturing for the EV sector, before Asian suppliers occupy the market entirely, and at same time continue the technology development both on enhanced lithium-ion technology generations and on game-changing technologies, like solid-state.

Three lending operations offer a perfect example of the Bank’s commitment and support to tomorrow’s mobility.

The first one, in 2017, is a venture loan of EUR 20 millions euro to Forsee Power SAS, a French small innovative company specialized in the design and making of battery systems for portable and mobile equipment and electric transport. With the most comprehensive range of batteries on the transport markets, Forsee Power is very well positioned for the future; it has already signed major battery supply contracts with renowned scooter and bus manufacturers, including CNHI (Iveco, Heuliez), CaetanoBus in Portugal and Wrightbus in the United Kingdom. In addition, the group is establishing strong positions in the industrial vehicles and railway markets. This financing will enable Forsee Power to increase its production capacity and launch the series production of smart battery systems in Europe and China, particularly for the transport markets (bus, railway, truck, boat, scooter).

The second project is Northvolt, to whom EIB has granted a EUR 52.5 million loan at the beginning of 2018 to support its investment for the setup of an innovative first-of-a-kind demonstration plant for the manufacturing of advanced Li-ion battery cells. This is a crucial investment to support the establishment of an innovative supply chain for electromobility and to accompany the transformation of the

automotive and mobility industry. Europe is currently lagging behind in lithium-ion battery production, an industry dominated by Asian players, and this highly innovative and strategic project deserves support from the EU and the EIB in order to fill this gap.

The third project is Allego BV, a leading European operator of charging solutions for electric vehicles with significant expertise in e-mobility, including the creation of a network of multi-standard quick charging stations in Belgium, France, Germany, Luxembourg, the Netherlands, and the UK. Allego collaborates with partners from various industries in the planning, construction and operation of charging stations. The company operates 12.000 charging points in urban areas and along the main European transport routes, supporting companies and drivers of electric vehicles via a cloud-based service platform. The EIB has provided a EUR 40 million quasi-equity financing to support Allegos’ growth and expansion of charging stations in Europe. This financing supports the upcoming investments in the extension of the normal, fast and high power charging infrastructure, installed and distributed over Allego’s countries of operation.

These are just three examples of risky investments supported by the Bank. There is an intrinsic risk associated with research, development and innovation investments, there is a lot of risk associated with developing, testing, validating and scaling up an innovative technology and there is even more risk associated with the uncertainty of market and customer acceptance.

Still, this is also where the European Fund for Strategic Investments (the “Juncker Plan”) plays a role. EFSI has made possible increasing the Bank’s lending volumes to higher risk projects and has made possible for the EIB to finance projects, which without EFSI would not have been possible to finance. One of EFSI’s primary objective was – and still is – to stimulate investments, particularly from the private sector. By enabling us to take higher risk in a project, it narrows the gap between what private investors may consider economically viable and unviable.

In particular, thanks to EFSI, we have developed a dedicated product, which we name ‘Venture Debt’, (although it has unique features compared to the commercial venture debt). This product enables the EIB to lend directly to companies that have an innovative product with good market prospects but can’t take the commercialization step, due to a lack of financing available for them. As of now, under this program, close to 75 companies

have benefitted from an EIB financing, representing a total €1.5bn of funds deployed.

Last, but not least, EIB is not only helping manufacturers to develop new technologies and introduce on the market new innovative vehicles. The Bank is also helping to remove some of the constraints preventing the adoption of electro-mobility b , e.g. by supporting the deployment of recharging infrastructure or by increasing the availability of financing for the acquisition of safer and environmentally-friendly electric cars by SMEs and fleets. This takes place also by working – like in France - with specialised commercial banks and by increasing lending availability for SMEs through dedicated credit lines.

This subject is absolutely critical to increase the awareness about the necessity of fighting climate change.

And it works !

We expect to have a lot of these operations during the next months.

A very concrete example on how we can support tomorrow’s mobility for everyone !

Tomorrow's mobility: a paradigm shift for infrastructure



Dominique RIQUET

MEP (ALDE Group) Vice-Chair Transport Committee

Tomorrow's mobility will be **cleaner, smarter and more versatile**. Of course, when we say that, we picture driverless cars, connected and autonomous vehicles, more user-friendly mobility applications on our phones, etc. Nevertheless, in order to achieve such a goal, transport infrastructure are also relevant, and will have to change too: not only because they are a support for this profound transformation, but also because they are an inherent part of it.

It goes without saying that the investment needs of transport infrastructure are colossal: roughly **130 billion euros per year in the EU** are required (without even taking into account those related to maintenance). How do we explain these enormous needs? One of the main reasons is a **paradigm shift** in our understanding of transport infrastructure: whereas previously, they were designed to allow vehicles to go from A to B, nowadays they also have to face and address a whole new set of issues. Moreover, in the context of budgetary constraints, both at EU and Member State level, ensuring an appropriate and adequate infrastructural response to these issues constitutes a severe challenge.

Firstly, there is a need to **tackle climate change**. Currently, 72 % of transport CO₂ emissions are coming from the road sector, a sector contributing for more than 25 % of the overall greenhouse emissions in the EU-28.

Transport infrastructure has a big role to play in reducing these emissions by two different, yet complementary approaches. On one hand, by focusing on multi-modality and interoperability, and notably on a **Modal Shift from road to rail** (less polluting), both for passengers and freight - which supposes developed, widespread and connected railway networks. Shift2Rail is a successful initiative, put in place by the EU, in order to achieve this goal. On the other hand, for road transport, the expected **rise of alternative fuels and electric vehicles is inseparably linked to the infrastructure and the deployment of charging stations**. Full of promise, and sometimes fantasy, these vehicles would drastically reduce emissions whilst favouring the production and injection of renewable energy into the grid, through dedicated infrastructure, and therefore increasing the resilience of our overall energy markets. However, to spark an electric vehicle revolution, it must be compulsory to invest both in charging infrastructure and in the reinforcement of the electric network as well as interconnection capacities. For too long, vehicles manufacturers have been too reluctant to produce alternatively-fuelled vehicles, due to a lack of charging points. This self-reinforcing "serpent biting its own tail" circle has to end through substantial investment in adequate infrastructure. Thereafter, the deployment of clean vehicles and infrastructure will greatly contribute to meeting our **environmental objectives** and the improvement of **public health**.

Secondly, there is a need to **preserve and strengthen our competitiveness**. At EU level, this has been one of the first and oldest objectives in transport policy, and undoubtedly, one of its greatest accomplishments. However, more has to be done in order to achieve the **completion of the Trans-European Network in Transport (TEN-T)**, estimated to 1.5 trillion EUR. The benefits expected are nevertheless numerous: facilitating cross-border connections, fostering greater economic, social and territorial cohesion, contributing to a more competitive economy while combating climate change. In the context of intensified international competition, this is a vital aspect for the prosperity of our European economies.

Additionally, there is a necessity to **ensure safer mobility** across Europe. Infrastructure is evidently crucial in that regard - the state of the roads people drive on has a huge impact on their safety - which raises the question of the maintenance of infrastructure. Moreover, in order to increase our competitiveness and our security, the **integration of new transport technologies in infrastructure** is mandatory (5G, broadband, communication vehicles to infrastructure etc.). The rise of connected and autonomous vehicles, facilitated by sufficient infrastructure, will improve the European mobility system as a whole, making transport safer, more accessible and sustainable.

As it stands, the stakes are high, the amount of work needed is significant, and the budget is not sufficient, at both European and National level. Whereas political and budgetary uncertainties are strong - which has a negative impact on private investment - many questions still remain, such as the delicate issue of the maintenance of infrastructure. At the same time, decision-makers should keep in mind that making the environmental **transition in transport socially acceptable** is not an innate thing, but requires a globally and coherent approach, as well as a democratic debate. In that regard, the recent events in France are a stark reminder of it, a special focus and care should be given to the most vulnerable people - both in social and geographical terms (peripheral, rural areas). If we want these populations to participate in this transition, the burden has to be shared equitably and the connectivity of all our territories guaranteed.

The future of our European Mobility - and more broadly, of our European societies - is at stake. We need to decide and act accordingly now, to put this paradigmatic shift into practice by investing today in the infrastructures of tomorrow. Considering the urgency of the situation, every effort made in that direction counts. As Camus wisely said, "real generosity towards the future lies in giving all to the present".

Facilitating transition to safe, clean, connected and automated mobility system in Europe



Maja BAKRAN MARCICH

Deputy Director-General for Mobility and Transport, European Commission

Mobility is changing. Connectivity and automation promise to deliver on safer and cleaner transport, delivering on our ambitious goals of zero emissions and zero road fatalities by 2050.

More than 25,000 people lose their lives on European roads every year, and despite this being just a small fraction of global road fatalities, we should not accept it. We are on the right track, but we still have a long way to go. We need to fully use the potential of current and emerging technologies, the data they generate, artificial intelligence, and the high-speed connectivity of our networks to further cut fatalities.

Human error is a factor in 90% of road accidents, so automation could help. At the same time, it is terrifying for us humans to simply let go and trust a driverless vehicle to do the 'right thing', whether we are inside a car or on a pedestrian crossing. The transition will be challenging, throwing up many aspects that need dealing with – resilience to cyber-attacks, protection of personal data, changes to skill sets, liability, the impact on jobs, social transition to new technologies, social inclusion, to name but a few.

Placing new technologies on the market is not enough for a smooth transition. Without public acceptance, technology will not produce benefits. We also need to be aware

that we are not operating in a vacuum – we have a strong industry, an important one for Europe, and we must ensure that we remain in the lead. Other economies are not sitting still and we need to manage this transition well for Europe to remain competitive.

In Europe, we want to ensure that when we talk about automation or access to data, we deploy technology both safely and within a fitting legal framework. In the 3rd Mobility Package of last May, the Commission presented a vision for connected and automated mobility in Europe and outlined concrete actions that will take us through this transition. Two actions are particularly important. First, we will put in place a single EU-wide Platform, grouping together all relevant public and private stakeholders to coordinate open road testing and pre-deployment activities. Second, under the next European long-term budget (2021-2027), we will establish a partnership with Member States and industry, thus providing a clear long-term framework for the strategic planning of research and pre-deployment programmes on driverless mobility.

Let's turn to environmental and health concerns. While European companies are among the world leaders in a highly competitive global market, we must also be aware that transport is responsible for a quarter of Europe's greenhouse gas emissions. Improving air quality in our cities cannot wait. Speeding up the transition towards zero-emission mobility is a necessity, and will lead to far-reaching changes in the sector. Clean mobility means making conventional vehicles more efficient and ensuring a much faster roll-out of low- and zero-emission vehicles.

Proposals in our Mobility Packages go in this direction. In particular, the new emission standards for light- and heavy-duty vehicles and the revision of the Clean Vehicles Directive will help the transition towards zero-emission mobility. The current Commission is entering the final year of its mandate and we have a very solid pipeline of proposals on the table. We call on the Member States and the European Parliament to maintain their dynamism in the months ahead so that we can finalise as many as possible legislative acts under the incoming Romanian Presidency. The

transition to safe and clean mobility requires a collaborative approach – we must all pull the same rope in order to reach the targets we set for the common good.

Beyond the legal and policy frameworks, these changes will have financial implications, and require investment in new mobility models, alternative fuels and related infrastructure, clean vehicles and renewable energies as well as education and skills. This is why we have proposed an ambitious budget post-2020, with a number of financial instruments targeting future mobility. Good examples are the Horizon Europe programme in support for research and innovation, and support for modern infrastructure under the Connecting Europe Facility.

Transiting to safe, clean and automated mobility is multifaceted and multi-layered. In the future, mobility will not only be driverless; it will be propelled by clean energy sources and it will align with mobility patterns and trends that are starting to emerge, such as shared mobility. Between now and then, what will reality look like? To start, we will go through a lengthy period of transition. We shall be seeing mixed traffic – autonomous electric vehicles sharing roads with today's traditional vehicles, with pedestrians, cyclists and other users.

In parallel, we will also be transiting to cleaner propulsion and a more efficient use of infrastructure and resources through intelligent transport systems. New business models will allow access to and use of data generated by vehicles and infrastructure. In short, we will need to take fully into account the fact that while mobility is transforming fast, existing passenger and transport fleets are here to stay for a while longer.

Our long-term strategic objectives for safer and cleaner mobility are clear. In order to reach them, we need to start delivering now. Together we can shape the framework that will bring us truly safer, cleaner, automated and more competitive mobility for the future.

For a low-emission mobility system throughout the EU



Miriam DALLI

MEP (S&D Group), rapporteur for CO₂ emissions from cars and buses

Transport is Europe's largest climate problem.

Road transport is the largest source of carbon emissions in the European Union, and its emissions are forecast to grow further. That is why this is an enormous challenge.

Measures need to be put in place to decarbonise road transport as soon as technologically, economically and politically feasible; and sufficient emissions reductions through deployment of zero- and low emission vehicles need to happen in the next decade.

This is the time to act.

Today's [legislation](#) on CO₂ standards for cars and vans will define [what technology is put on the market](#) from 2025 onward and, also, well beyond 2030. This is all the reason why the European Parliament has pushed strongly for ambitious CO₂ emission reduction targets for cars and vans.

Today, we have set a 37.5% target for 2030.

Speeding and scaling up the development and sales of zero- and low emission vehicles are crucial for any successful long-term strategy for decarbonising Europe, and it is key in ensuring European competitiveness, especially in comparison to China.

With supply chains stretching across the whole of the EU economy, a managed transition to e-mobility offers a wide range of opportunities for most countries. Many manufacturers, businesses, investors and countries are preparing for such a change already. This allows them to capture emerging

growth and jobs opportunities all across the different sectors.

Endorsing this technological transition, and decarbonisation itself, would create more jobs, more economic growth and a cleaner, safer world.

As the Parliament's rapporteur on this important piece of legislation, I have always wanted the European Union to deliver real results, wanted European consumers to enjoy the benefits of clean mobility, and wanted the European auto industry to remain competitive and maintain its share in this rapidly changing global market.

Pushing back change will not make our industries more competitive. It will only keep some industries in a comfortable zone for some years, until we realise that other continents are running ahead of us. Then it might be too late to catch up and we would end up losing out on job and industrial opportunities.

The transition to clean mobility requires targeted policy intervention driven by agreed standards and economic instruments until the cost of new technologies reaches parity with existing technologies. This strong, targeted policy intervention is what the Parliament's position set as its final objective.

Parliament wanted targeted policies that help modernise the technologies used, making vehicles more efficient, with varying degrees of electrification, while at the same time ensure that workers who currently produce legacy technologies are retrained for quality jobs in producing the technologies of the future.

Let's be honest, this transition can help positively our economy. This is a transition that has the potential of reducing the EU's dependence on imported oil and petroleum products, and shift demand towards domestically produced energy and electricity.

Most definitely this is directly linked to the location where zero- and low emission vehicles will be manufactured in the future.

More certainty to investors will support the development of innovative European value chains including batteries manufacturing promoting Europe's industrial growth. I definitely want these clean vehicles and green automotive battery cells to be manufactured within Europe. More so, since it is estimated that the global market for batteries can reach €250 billion per year by 2025.

We have the potential to tap into this market and not only catch up with global competitors, but actually become leaders.

In all, I believe that this is not the time to push back change, because pushing back will not make our industries more competitive.

Experience with previous targets for CO₂ reduction showed that albeit the initial resistance, the European automotive industry, being more fuel efficient, proved to be more competitive during times of crisis such as when we were hit with hikes in oil prices.

When setbacks struck, European manufacturers managed to increase their market share whilst automotive companies in other continents like the US struggled for years.

Not too long ago, the United States government had to bailout the automotive industry, with the federal government taking over GM and Chrysler in March 2009 and requiring that Chrysler merge with Italy's FIAT. The Obama administration then used this take-over to set new auto efficiency standards, and forced American automakers to be more competitive against Japanese and German firms.

This same rule applies today. Driving research, development and innovation in CO₂ saving technologies will definitely help our industries and the European car manufacturers. It will help the EU retain its competitive advantage, ensure consumer benefits, environmental, climate integrity and our citizens health.

In Katowice, the European Union spoke of leadership in climate action. This ambition needs to translate into concrete commitment, and this legislation is a key component to that ambition.

The deal reached between the European Parliament and European Council took place despite fierce opposition. But the real win is the introduction of a mechanism to address the difference that currently exists between emissions in the laboratory and on the road.

Clean mobility in Europe: ambitious goals need to be set!



Karima DELLI

MEP (The Greens/EFA) Chair of the TRAN Committee

Reducing vehicle emissions is more than ever an imperative for the European Union (EU). While the economy as a whole has seen a drop in greenhouse gas emissions for the period 1990-2015, this is not the case for transportation. According to the latest report of the European Environment Agency, while emissions had decreased overall between 2013 and 2014, the curve reversed between 2014 and 2015, mainly because of the explosion of road transport. In concrete terms, sector emissions increased by 1.6% in 2015, as in 2014. In total, road transport still accounts for more than 20% of total emissions in Europe. The EU does not remain inactive in this area. But the efforts to date to improve the energy efficiency of passenger and freight vehicles are far from offsetting the growing demand for it - and the resulting emissions. If we want to respect the objectives of COP21, we have no choice: we must do more and better. The health of our children and future generations depends on it.

The aftermath of the Volkswagen scandal has shown the backlog of manufacturers and member states to bring the European car industry into the 21st century. As the European energy efficiency test system is decades old, the manufacturers have come to handle the tests, covered by member states only concerned about the market shares of their national industry champions. Protecting our health, respecting consumer rights and the

law as a whole was no longer a priority. But is this the case now, after the EMIS Committee of Inquiry led by the European Parliament, infringement proceedings launched by the European Commission against the States guilty of not having implemented the law, as well as the revision in during the type-approval legislation for vehicles? It is permissible to doubt it. Indeed, everything suggests that following the recall of vehicles for which Volkswagen has defrauded pollution tests, the energy efficiency of these cars is lower in real driving conditions than it was! More than ever, the creation of a European policeman, whose mission is among other things to control the effectiveness of tests carried out everywhere on the territory of the internal market, is essential.

Ambitious goals also need to be set. The Commission could be the initiator of a «climate-transport package», one of whose objectives would be the reduction of 25% of the car fleet by 2025 thanks to the sharing economy and the improvement of transport which could increase the number of alternatives to the private car. But it would also be worthwhile to suggest a European production target of 20% of electric cars by 2025, in order to move from a largely diesel-fuelled fleet to a fleet with low emissions. Urgency requires us to act quickly, unless we still suffer in our cities the consequences of the pollution of existing cars. Paris and London are leading the way in tackling all-cars on their territory, as is Stuttgart, where the use of vehicles with engines older than Euro4 is now banned in the city centre. If we need to reduce the number of cars in our cities (let us not forget that traffic congestion has cost 1% of European GDP every year for more than 10 years!), electricity could be also part of the solutions. And although the price of these vehicles remains prohibitive for a majority of European citizens, the statistics of the NGO ICCT show that the first generation of this type will see its price reach that of a conventional combustion car by 2021, as production increases. Thus, three million electric cars will be sold worldwide in 2018, mainly in the United States, Europe and China, where the fight against air pollution is a political priority. For this to be effective, all the actors involved must be mobilized: the cities and the Commission are already mobilized, the States to assume their responsibilities by encouraging the creation

of zones with zero emission, adequate infrastructures, and the purchase by them. consumers through tax schemes still too often devolved to the purchase of diesel vehicles.

Having clean cars is not a fantasy. It's a need, for the protection of our planet and our health. But it is also for our autonomy at all. Autonomy for the EU, which imports \$ 350 billion worth of oil each year, a third of which goes to cars. Autonomy for the 15 million European employees of the automotive industry, who remain today prisoners of the production model of the twentieth century. Autonomy for the European consumer, who pays dearly for the lack of energy efficiency of his vehicle today.

Intermodal transport, COP 21 and COP 24



Wim VAN DE CAMP

MEP (EPP Group), EPP coordinator Transport and Tourism

We can be clear: the model shift (from road to rail and inland waterways) has failed. This noble principle has been the underlying approach for EU transport policy during the last decennia, but was not able to meet the challenges in the 'real world' in terms of 'cost price', speed, competitiveness, social policy and sustainability. This is not due to the road transport sector, but foremost due to the inflexibility of the rail and inland waterway transport sector. The road sector has more competitive prices, is more flexible and has the big advantage of the 'last mile delivery' and therefore an 'open door' service. Having said this, there are people that claim that road transport is too cheap for the service delivered per kilometre. In a very competitive market, the road transport sector has lowered its prices constantly. This has led in some cases to bad working conditions for drivers, as the competition between companies - also from non-EU countries - is rough and tough. In addition to this the road transport sector is accountable for a large amount of the CO₂ emissions. Therefore, soon truck emissions will be limited on a EU-level.

Intermodal transport (the switch to another mode of transport within one journey) can be a solution for the negative effect of the road transport on the environment. This may also solve another problem at the same time; the many traffic jams on the European roads. The damage as a result of traffic jams accounts

for billions of Euros each year. Long distance transport in large quantities are very suitable for rail and inland waterway transport. Of course we will still be needing the truck for the 'last mile delivery'. For reaching the COP 21 and COP 24 goals this is a good approach. Maybe digitalisation and use of 3D printing on a large scale might really reduce the absolute amount of transport in the future, but for that to happen we still have a long road ahead.

In order to reach an efficient and clean intermodal transport, we still need to make big changes: Although many good attempts, the rail sector is still slow and inflexible. Especially the word 'cross border' has a paralyzing effect on this transport mode. Freight trains often have to wait for a long time because technical and security systems are not integrated well enough throughout the EU. The EU broad ERTMS (European Rail Train Management System) is not getting enough momentum because many member states (and also inside one member state) are working with different levels of implementation. Investments in load and offload stations are lacking behind. Apart from that, many rail tracks in the EU are very congested due to passenger transport, which negatively effects the flexibility of freight transport by rail.

Another interesting question in this respect is: how does the rail sector get its power supply? In the Netherlands passenger trains are powered by wind and sun energy. In Poland this is certainly not the case (yet). The inland waterway sector seems to adapt faster and better to the increasing demand for intermodal transport. Especially the professionally organised transport system on the Rhine still has a lot of capacity available. Regrettably, quite a couple of large infrastructure projects are delayed: Seine – Schelde and Donau – Elbe. Investments in these kind of projects are very beneficial to the environment and therefore green and sustainable. Unfortunately, climate change had a very big, direct and negative impact on the inland waterways. Due to the extreme draught ships could only be loaded for 50%, because of a lack of water in the rivers. Digitalisation, as mentioned before, has to play an important role in further improving and increasing the intermodal transport. Not only regarding a smooth planning and flow of goods, but also

with respect to electronic consignment notes/waybills (e-CMR). The implementation thereof by the individual member states is abominable. In addition, customs administration should be largely improved.

To conclude I would like to pose a dangerous question: shouldn't we organize the planning and organisation of EU intermodal transport in a more centralized way? At this moment, many initiatives for investments and land management are failing and coming to a standstill because of slow or unwilling member states and regions. In this moment in time it is not a grateful task to plead for more centralized power and perseverance for and from Brussels. But right now we are absolutely too slow. Too many layers of governance are working in too many different directions and with a different pace. Money from Brussels also means responsibility and not only non-binding allocation of these funds on a national level. In making these remarks, I am guided by the critical reports of the European Court of Auditors. The aforementioned investments are too often not effective and nor interconnected. At this moment the European Parliament is working on a regulation to improve, accelerate and streamline the TEN-T procedures. I won't come as a surprise that I am a big supporter of this approach. Any comparison with China is difficult, but they are moving at a higher speed! Realising the agreements and delivering on COP21 and COP 24 ask for a much clearer and faster approach. Maybe the intermodal transport in the EU can also benefit from this!

Towards decarbonising Europe's mobility system



Hans BRUYNINCKX

Executive Director, European Environment Agency

As a society, we benefit immensely from our transport sector especially the freedom it brings. But our on-going addiction to the combustion engine and fossil fuels directly harms our health and our environment to an unacceptable degree. Technological improvements have led to cleaner and more efficient engines, and a number of European policies have helped to improve our air quality since the 1970s. But greenhouse gas emissions from Europe's transport sector, and especially from road transport, are increasingly unacceptable in terms of the pressures it exerts on the environment and our climate.

Transport is a key economic sector in Europe, so it's critical that if we are to achieve the long-term vision of the EU's Seventh Environment Action Programme (7EAP), of 'living well, within the limits of our planet' we will have to seriously step up our efforts to move to a more sustainable transport sector and mobility system.

The transport sector is posing an increasing headache for the European Union as it tries to reduce carbon dioxide emissions and meet its climate and energy targets. With more vehicles on our roads than ever before, it's no surprise that transport emissions are up as [our recent data and reports show](#). Estimates from EU Member States show that greenhouse gas emissions from transport were 28% above 1990 levels in 2017. Road transport alone

accounts for 82 % of the transport greenhouse gas emissions and one fifth of the EU's total greenhouse gas emissions and have grown since 2014. Emissions from transport have increased over the last three years, and this trend is expected to continue in the years ahead due to growth in the sector.

Road transport is also one of Europe's main sources of noise and air pollution, especially of harmful pollutants such as nitrogen dioxide and particulate matter, according to the EEA '[Air quality in Europe — 2018 report](#)'. Other sources, such as agriculture or industry, are also big emitters of air pollutants and greenhouse gases. But in terms of air pollution, road transport emissions are often more harmful than those from these other sources, as these emissions happen at ground level and tend to occur in cities, close to people. Many people living in Europe's urban centres are exposed to levels of air pollution deemed harmful by the World Health Organization. The pollutant most linked to road transport, nitrogen dioxide (NO₂), caused the premature death of an estimated 79 000 Europeans in 2015 according to our Agency's latest health impact assessment. Meeting our long term goals of living sustainably will involve taking far reaching measures and will require an integrated approach across many sectors, including transport. Member States need to accelerate progress in transforming key systems of production and consumption, including in food, energy and mobility, that have the greatest environmental and climate impacts.

Unfortunately, there is no easy quick-fix solution to reduce air pollution and greenhouse-gases. But phasing out the combustion engine and fossil fuels that power it must be part of Europe's shift to a low-carbon future and a healthier society.

The agreement reached between the EU Council and European Parliament in December to reduce carbon emissions from new cars by 37.5% by 2030 compared with 2021 is a clear signal that the era of the combustion engine is ending. It will spur the move towards zero emission vehicles, as incremental efficiency improvements will simply not be enough. On the air quality side, the ongoing controversy over diesel-gate has also helped

highlight the need for Europe to move beyond the combustion engine. But ultimately, the best solution lies in shifting to sustainable transport – where we reduce the reliance on individual vehicles and use a wider mix of more environmentally friendly modes of transport, like trains, bicycles, or public transport.

We have already seen investments in cleaner and more sustainable transport options and we are starting to see changes in attitudes and habits across European cities in embracing cycling, auto-free zones, or car sharing. Taxes and financial incentives can also help drive reductions in average carbon dioxide emissions from new passenger cars.

The European Commission's strategy for low-emission mobility has the ambition to reduce transport GHG emissions by 60% by 2050 compared to 1990. The second and third Mobility Packages proposed by the Commission in November 2017 and May 2018 include legislative initiatives on road transport vehicles and infrastructure. They promote a broad take up of low-emission alternative fuels and low-emission vehicles on the market.

We at the Agency are doing our part as well, providing the latest, most accurate data on air pollution hotspots across Europe via new tools such as the European Air Quality Index and informing Europe's policymakers with regular reports and information on how to make transport more sustainable. Alongside action at the European level, action at national and local level is crucial, as many actions require innovative solutions that work best when acting locally. There will be difficult choices ahead, but we owe it to ourselves and to future generations to take action to ensure our well-being and the health of our environment.

Developing greener rails: Shift2Rail's research & innovation on sustainable infrastructure



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Looking into more efficient infrastructure, one of European rail's ambition is to develop a system able to live-monitor the status of every rail asset in the network. Knowing the status of bridges, tunnels and rails would not only help repair broken assets faster but engineers expect it could predict a failure before it happens, thanks to a prognosis algorithm – making rail infrastructure upkeep more effective and sustainable.

The Shift2Rail Research & Innovation programme, worth €920 million euro, is managed by the Joint Undertaking, an institutional public-private partnership established by the European Union. Shift2Rail's dedicated rail infrastructure R&I programme aims to develop predictive maintenance schemes, but also smarter energy-management strategies and disruptive technologies to make rail upkeep faster and further automated.

Shift2Rail's size is especially important when it comes to infrastructure R&I, which often requires large investments. "Historically, high cost barriers have prevented any significant change to the design of track and civil engineering such as embankments and bridges", says Andy Doherty, CTO at Network Rail, Britain's national rail network management entity.

The programme looks into the basic engineering, seeking new technology, new

understandings of the physics of railways, and test-validated solutions ready for market uptake, Mr Doherty explains.

Harnessing the power of data

Today, technicians review rail assets periodically and repair them when broken. Thanks to live information from sensors placed on different elements, engineers expect to know in real time if an asset needs servicing – leading to reduced downtime of infrastructure and rolling stock, which entails less delays for passengers and reduced use of energy.

"Automatic and fully integrated monitoring systems make available huge volumes of real-time heterogeneous data from different sources, paving the road for the application of big data techniques. The big challenge is to transform data into knowledge that allows the development of data-driven risk-aware decision support systems", says Nadia Mazzino, Vice-President for Digital Railways and Innovative Technologies at Ansaldo STS, a rail manufacturer and Shift2Rail-Member.

In this context, the definition of an 'integration layer' allows the collection and exchange of the available data in a canonical data format. "It aims at supporting fusion, integration, and adaptation of different data sources, thus facilitating interoperability and development of new data-driven tools", says Ms Mazzino.

Research in this field goes even a step further. Live information on the network, processed using Artificial Intelligence (AI) techniques, could support fast and well-informed decisions. "Decisional processes, which often still rely on the skills of specialised human operators, will achieve a high level of automation through the introduction of AI, based on prescriptive analytics, computational models, and optimisation techniques", explains Ms Mazzino.

The application of AI in the rail sector means shifting from *descriptive analytics*, which makes it possible to automatically collect and visualize the available data, to *diagnostic and predictive analytics*, which shows the current and future status of rail infrastructure, allowing for *prescriptive analytics*, developing automated tools to support decision-making.

AI would enable rail providers allow to offer additional services to customers. On the other hand, infrastructure managers and service operators could identify critical defects earlier and adapt quickly to unexpected events, improving service for passengers and making railway infrastructure more reliable, resilient and available.

Improving the rail energy flows

To improve network's efficiency, Shift2Rail-funded researchers are also developing methodologies to provide network managers with

real-time information on the use of energy of rail assets such as switches, tracks and catenaries.

One of Shift2Rail's projects developed a proof of concept for 'smart energy metering' on the light rail network of Reims, France. Researchers developed a solution for measuring the energy flow both on-board and on the electrical grid. Feasibility of this model, which makes use of AI, was tested on-board of tramways and on ground in a traction substation. The tramways and the substation were equipped with current and voltage sensors, GPS, accelerometer, CO₂ and temperature sensors, which compiled and sent their data to a central server.

Research aims to produce an exact map of how the energy flows within the entire railway system. This would enable engineers to better understand the systems' energy usage and devise strategies to improve it, making railway systems more sustainable.

"Some interesting findings revealed that 'low-hanging fruits' in terms of improvements could be easily found and implemented if a system approach is undertaken", says Marius lordache, Simulations & Performances and Energy Efficiency Manager at Alstom, a member of Shift2Rail.

Disruptive ideas, welcome

Looking into new radical ideas is also an essential feature of Shift2Rail's innovation programme. Some researchers are looking at nature for inspiration. It might seem odd, but some widespread solutions like Velcro are inspired by animal or plant behaviour.

Henk Samson, Senior Programme Manager for Business Development and Innovation at Strukton Rail, a Shift2Rail member, thinks 'bio-mimicry' (emulating nature with robotics and automation), might revolutionise railway and drops some ideas.

For example, inspired by spiders' movement, autonomous rail vehicles could get in and out of the tracks just when needed, avoiding unnecessary occupation of rails. Another proposal: sets of hundreds of light and small robots could enter the track to perform maintenance tasks where power and strength are needed – an idea based on swarm robotics, inspired by beehives and ant colonies.

"These ideas might be futuristic but there are some solutions that can be implemented in a shorter term", says Mr Samson. "For example, adding some robot features and extra add-ons to excavators used on tracks to be used as robot platforms could make a start".

Working for greener rails

Sustainability is at the core of the Shift2Rail programme as one of its goals is to halve carbon emissions produced by the rail sector. "We believe that data-driven infrastructure management and smart energy metering are some of the most promising areas for making railways more sustainable", says Carlo M. Borghini, Shift2Rail's Executive Director.

"We are developing innovative solutions to improve railways' sustainability even further. We work not only on infrastructure, but also to devise lighter train parts, reduce vibration and noise emissions, and create an IT ecosystem to make railways more attractive to passengers; thus reducing transport emissions overall", explains Mr Borghini.

"A shift to an even greener rail would be a huge contributor to the zero-emission future we aspire to in Europe". The first phase of the Shift2Rail initiative, which launched its first projects in 2016 under the Horizon 2020 Programme, with some Lighthouse Projects already started in 2014, is due to launch its last call for new projects in 2020.

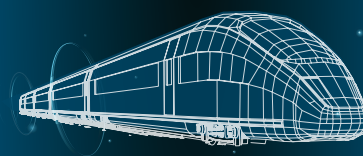
"Until now, we have set the foundations for a real shift to rail, developing cutting edge solutions in only two years of work at full capacity. We have solid ground to substantially continue investing in R&I beyond 2020 for more efficient, greener, digital, automated and integrated rail in Europe".

*This article has been written with the contribution of **Mr Andy Doherty**, CTO, Network Rail; **Ms Nadia Mazzino**, Vice-President for Digital Railways and Innovative Technologies, Ansaldo STS; **Mr Marius lordache**, Simulations & Performances and Energy Efficiency Manager, Alstom; and **Mr Henk Samson**, Senior Programme Manager - Business Development and Innovation, Strukton Rail; representing member organisations of the Shift2Rail Joint Undertaking. The content of this article is the sole responsibility of the Shift2Rail Joint Undertaking.*



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SHAPING THE
RAILWAY
SYSTEMS OF
THE FUTURE

Energy at the heart of a low carbon mobility



Dominique RISTORI

Director General for Energy, European Commission

The European Union is fully committed to make the clean energy transition a reality and has been leading the way forward. The EU has successfully decoupled its CO₂ emissions from its economic growth: between 1990 and 2016, greenhouse gas emissions decreased by 22% while the economy grew by 54% over the same period.

Last year, the EU continued to demonstrate its ability to turn its commitments into actions. Important and rapid progress were made in the interinstitutional negotiations on the Clean Energy for All Europeans package. This package sets the most advanced regulatory framework to modernise the energy system, support clean energies, innovation, high-quality employment as well as a strong industrial basis in Europe, while putting consumers at the heart of a clean and fair energy transition.

Already four of the eight legislative proposals have come into force, notably on energy efficiency and the energy performance of buildings, renewable energies and governance. Clear and ambitious objectives have been set going beyond what was initially proposed - reflecting technology development, cost-reduction and the necessity for Europe to show ambition and leadership in the fight against climate change.

New targets were agreed at EU-level by 2030 of at least 32.5% for energy efficiency and of at

least 32% for renewables. Both targets include the possibility of a further upward revision in 2023. The new governance system will ensure that Member States can work together towards achieving the 2030 objectives, while providing investors' certainty.

In addition, new rules for making the EU's electricity market work better have been provisionally agreed. This will ensure that the energy system is more flexible and able to integrate the growing share of renewables in a secure and cost-competitive way. Indeed, already today, over 30% of Europe's electricity is generated by renewable energies and this share is expected to exceed 50% by 2030. Consumers will also be able to participate more actively in the market and play a central part in the clean energy transition. The new electricity market design will also contribute to the creation of jobs and growth, and attract investments.

These provisional agreements on the new electricity market design mark the completion of negotiations on the Clean Energy for All Europeans package, putting the EU in the lead in terms of rules to accelerate and facilitate the clean energy transition. This takes the EU a step closer towards delivering the Energy Union.

The clean energy for All Europeans package is not only relevant for the energy system; it is also contributing to the decarbonisation of other economic sectors and notably the transport sector where decarbonisation is key to achieving Europe's commitments under the Paris Agreement. Indeed, transport accounts for over 33% of Europe's energy consumption and about a quarter of Europe's CO₂ emissions. It is the main cause of air pollution in cities. More specifically, road transport accounts for more than 70% of greenhouse gas emissions related to transport. In that context, the clean energy transition plays a central role to successfully move towards low-carbon mobility.

The potential for the decarbonisation of transport is significant and actions are needed on all fronts ranging from increasing the share of renewable energies, developing renewable hydrogen and accelerating the electrification in the transport sector. The new Renewable Energy Directive notably promotes cleaner transport by setting a share of at least 14% coming from renewable sources by 2030. It also

includes a sub-target to promote advanced biofuels. Besides, the new Energy Performance of Buildings Directive includes ambitious provisions to ensure that buildings' car parks will be progressively equipped with recharging points for electric vehicles, both in residential and non-residential buildings. The new electricity market design will also support the uptake of electric vehicles and their integration into the grid through more flexibility, proper price signals and measures for the connection of recharging points to the electricity distribution network.

The clean energy transition is a clear economic opportunity with tangible benefits for the economy, EU industries and all Europeans. When it comes to clean mobility and in particular electro-mobility, the EU is committed to build a strong industrial basis and a strong market for batteries in Europe. This is notably the objective of the EU Battery Alliance which aims at creating a whole competitive value chain in Europe. Between 2018 and 2020, the Commission will invest €200 million from the Horizon 2020 programme to support the development and production in Europe of the next generation of electric batteries. This will contribute to the competitiveness of EU industries and to the ongoing transition of the EU economy.

The shift to renewables and increased electrification is central to achieve carbon neutrality by 2050. It is expected that the share of electricity in the EU's final energy consumption will more than double by 2050, compared to the current 21% share. This is notably due to the accelerated electrification of the transport and heating and cooling sector in the context of the clean energy transition. This is highlighted in the strategic long-term vision for a prosperous, modern, competitive and climate neutral economy by 2050 "A Clean Planet for all" adopted by the Commission last November. This long-term strategy looks at the transition necessary in all sectors of the economy, including the strong inter-linkages between the energy and transport sectors. It shows how Europe can continue to lead the way to climate neutrality by modernizing the economy while ensuring social fairness for a just transition that works for all Europeans.

A new edge for European Refineries



Fabio MARCHETTI

Senior Vice President, Head of European Government Affairs, Eni SpA

Reducing greenhouse gas emissions from transport is one of Europe's top priorities. Part of the recipe to doing so involves turning waste into fuel.

Eni has just started up a new project that transforms organic urban waste (kitchen waste and leftovers, from food scraps to dirty napkins) into clean energy. The pilot project, launched at the Gela biorefinery in Sicily by Syndial (Eni's environmental company), represents the first milestone in a process driven by the company's own research and its own proprietary waste-to-fuel technology. Waste is transformed into bio-oil for use as a component in the production of second-generation biofuel. Through liquefaction, the energy content of the initial waste biomass is nearly all concentrated in the bio-oil, which in turn can be converted into biofuel. The Gela pilot plant has a bio-oil production capacity of approximately 70 kg per day and is supplied with 700 kg of organic waste per day.

After a pilot phase, we plan to build waste-to-fuel plants on an industrial scale, eliminating a great amount of urban organic waste through reuse and providing significant environmental benefits to large urban areas in Italy and abroad.

Waste can also be used to produce other commercial energy products like bio-methane, heavy oil, bio-hydrogen and bio-methanol that

offer opportunities to reduce GHG emissions while fully applying the principles of the circular economy. Technology, experience, know-how, skills and, of course, investment in R&D are the ingredients that make the difference in enabling refineries to broaden their production line from traditional processes to converting waste into innovative and more sustainable products.

The Gela project is yet another piece in Eni's strategy of integrating the principles of circular economy into its activities. But it also suggests part of the solution to the broader, much more challenging issue of guaranteeing access to affordable energy to a growing (and energy-thirsty) global population – expected to reach 9 billion people by 2040 from 7 billion today – whilst ensuring this happens sustainably, limiting the rise in temperatures within 2°C.

Eni has set an integrated strategy for the energy transition: reducing its direct GHG emissions; refocusing its portfolio on lower carbon-intensive activities; developing new green projects and investing in Research and Development – a fundamental element that underpins the energy transition. When translated into our approach to mobility, this strategy means developing advanced and more sustainable biofuels, while at the same time promoting a broader use of natural gas (both compressed, as CNG, and liquefied, as LNG) for road and marine transport. It also includes supporting changes in driving

behaviours. For instance, Eni has launched a successful car sharing initiative called *Enjoy*.

After the 2008 economic crisis, the refining industry was an ailing business. Yet, to turn our strategy into reality, we invested half a billion euros in a first-of-a-kind operation to transform two of our refineries into biorefineries able to produce high-quality green diesel from all types of biological raw materials (vegetable oils, waste oils, animal fats, by-products from the food industry, etc.)

The traditional refineries of Venice and Gela have been re-imagined by identifying innovative solutions and using environmentally and financially sustainable green production methods. Venice was the first refinery ever to be converted into a bio-refinery; through this conversion Eni placed the circular economy at the core of its activities. The refinery will be further upgraded in 2021, increasing processing capacity to 560,000 tons of oil. The Gela biorefinery – which will be completed in a few months – will reach a processing capacity of around 750,000 tonnes of vegetable oil per year.

The European refineries are a precious heritage with a huge innovation potential. We must support them, use their competences, technology and skills to contribute to the energy transition, which will need all of Europe's best capabilities.

We should not waste this great opportunity.



Total, an innovative multi-energy & services provider for the future of mobility



Philippe MONTANTÊME

Senior Vice President Strategy, Marketing & Research Total Marketing & Services

Over half of the oil consumed in the world today is used to move people and goods. This percentage continues to grow as alternative energies for power generation and domestic use are developed.

Oil has been used almost exclusively for ground, sea and air transportation. The remarkable energy density of hydrocarbons and the ease of moving, storing and distributing them are the reasons we rely on them for over 90% of our energy in that sector.

After a long unbroken stretch of nearly a century, transportation is experiencing a major transformation. Climate issues, evolving habits and services, alternative energy use and innovative technologies will radically reshape the sector.

Growing Demand

Energy demand for transportation is a fast-growing market. Widely accepted assumptions project that the current 1 billion fleet of cars on the road will more than double worldwide by 2040. Emerging economies will be the biggest growth drivers. Their very low car ownership rates — less than 150 cars per 1,000 inhabitants in China and fewer than 30 in India — fall far short of OECD countries' 400 to 600 vehicles per 1,000 people.

Since goods shipping requirements correlate directly with global GDP growth, we can expect this to nearly double within 25 years.

Energy Efficiency, the Top Driver

Improving energy efficiency is and will long remain the primary engine to shrink

transportation's environmental footprint. Whether spurred by regulatory restrictions, such as the ones on cars in Europe, or by economics for marine and air transportation, this improvement has clearly demonstrated its impact in the last 10 years. Energy efficiency goals are now global and affect all types of transportation, including trucks in the near future in the European Union and certainly marine shipping & aviation over the next decade. For the road transport, efforts should continue on improving combustion engines while scaling up EV, PHEV for a smart combination of solutions, therefore optimizing costs, CO₂, air quality in the coming decades in order to reach ambitious climate targets.

It is possible to lower consumption down to 2 liters per km for an average car, which is largely competitive compared to EV including in terms of CO₂ footprint for their entire lifecycle (including construction and end-of-life phases).

A Mix of Alternative Solutions

Rather than relying on liquid hydrocarbons, a mix of different energy sources and their storage methods will co-exist in the future: electric vehicles for Europeans for an average daily use of 40 kilometers and electric buses in our city centers & suburbs, trucks that will more likely run on natural gas, with a growing share of biogas (and potentially electricity for the last mile). Liquid biofuels will be adopted for air transportation, which has more demanding requirements and is harder to find substitutes for.

How fast these alternatives penetrate markets will be determined by a complex combination of their ability to meet needs, regulatory requirements, changes to the production base and infrastructures, behavioral and social acceptability, creation of energy supply points and economics. Alternative solutions will very likely not capture more than 20 to 30% of the main markets by 2040, which is already quite a substantial evolution.

New Behaviors

On top of this technological metamorphosis, mobility habits are also radically changing. That model is evolving very quickly from ownership to usage. It powerfully fast-tracks new forms of mobility such as car-sharing, ride-sharing and multimodal transportation, with obvious impacts on energy demand (vehicles better suited to purpose with improved filling systems, faster fleet turnover, etc.).

Total, an innovative multi-energy and solutions provider

As an energy supplier, Total has the ambition, credibility and resources to support all these changes in the transportation sector.

First, we boost the efficiency of internal combustion engine vehicles by supplying lighter materials, lubricants and high-performance fuels for cleaner, more fuel-efficient engines.

Beyond the supply of energy (petroleum products, electricity, natural gas, hydrogen, ...), the entire customer delivery infrastructure needs to be rethought. The number of public charging points, for instance, will need to be adjusted between public domain and private locations (home, regular parking spots) where a high proportion of EV charging will be done. Total has already started to install connected and "smart" charging points. In parallel, new Liquefied and Compressed Natural Gas (LNG and CNG) stations have to be built along major highways and in the main seaports. Total is doing a lot to make this happen through major investment plans to address new needs in Europe and North America.

Total is also taking advantage of every available digital resource to make it easier for customers to transition. An example is "one bill for electricity," regardless of whether you access the power at home, in a parking lot or service station, or on public road. Likewise, it is vital to offer a single fleet management package to all business customers with fleets made up of both internal combustion engine (gasoline, diesel and gas) and electric vehicles.

Total is also the owner of Saft, the leading developer and manufacturer of batteries in Europe. Saft has been making high technology batteries for 100 years and is currently spearheading a strategic R&D project on the battery of the future (solid state technology) within the framework of the EU battery initiative led by vice-president Sefcovic

EU institutions are currently finalizing a major legislative package on mobility for the next decade in consistency with the Paris agreement. It is important to stress that the all-electric current trend should be rebalanced into a smart combination of solutions, under the principle of technology neutrality, while optimizing environmental footprints with social needs, competitiveness and societal acceptability.

Transport and the need for efficiency



Seán KELLY

MEP (EPP Group), Member of the ITRE Committee

As I return, at the time of writing, from the COP24 Climate Conference in Katowice, it is quite evident to me, as if this wasn't already blatantly obvious, that we need significant emissions cuts across the board - across all sectors - if we are to stand a chance of meeting the 1.5oC or 2oC targets. Looking at the different emitting sectors in the EU, we see evidence of progress. Even if some member states lag behind in certain areas, generally it is clear that big strides have been made in renewable energy, in energy efficiency, and in the reduction of emissions from our industrial sectors in recent years. One area in which insufficient progress has been made, however, is transport. We badly need to find ways to increase the efficiency of our transport sector and make big improvements to its emissions performance.

Emissions are not declining in the EU Transport sector; levels are now around 25% higher than they were in 1990, and road transport remains responsible for close to 80% of oil consumption in the EU. Additionally, the average CO₂ emissions from new passenger cars increased in 2017 (119 g/km, up from 118 g/km in 2016), something that is frankly astonishing given the pressing need for reductions in the sector. It is clear that greater action is badly needed.

Thankfully, at EU level at least, these actions are now being taken and I strongly welcome

the Commission's recent initiatives which aim to improve the emissions performance of the sector. In December, a deal was reached on the hugely important Regulation on CO₂ Standards for Cars and Vans. The agreed text ensures new cars will have 37.5% fewer emissions in 2030, while vans will have 31% fewer. This is a great result as it will better empower Member States to meet their 2030 non-ETS emissions reductions targets, improve air quality, and reduce fuel consumption costs through increased efficiencies. I congratulate the Parliament rapporteurs, the Austrian Presidency, and indeed Commissioner Miguel Arias Canete on a fantastic result, and I look forward to seeing it being translated into real actions in the coming years.

These provisions regulating the vehicles themselves nicely complements our work undertaken during the negotiations on the new Renewable Energy Directive (REDII), which I was proud to negotiate on behalf of the EPP Group earlier this year. During these discussions, the goal of the European Parliament was to push for significantly increased ambition on the level of sustainable renewable energy in the transport sector. While Council's General Approach unfortunately meant that the Bulgarian Presidency had quite an inflexible negotiating position on these points, we were able to agree on two important areas that needed increased incentives: advanced biofuels and electric vehicles.

Advanced biofuels are all about resource efficiency – there is huge potential for us to decarbonise our transport fuels by blending sustainable advanced biofuels from wastes and residues, thus creating a market for these feedstock, boosting innovation in the development of new alternative fuels, and displacing more and more fossil fuels from our transport mix. With the new blending obligation, these fuels are given the needed incentive to be an important element in the decarbonisation of our transport sector.

REDII also gives a much needed boost for the deployment of electric vehicles, building on the important provisions on mandatory EV charging infrastructure in the Energy Performance of Buildings Directive. REDII gives electric vehicles a multiplier of 5 in the transport obligation in line with

the comparative increases in efficiency over combustion engines that electric vehicles can reach. This has now been added to with an important incentive scheme in the CO₂ standards for cars and vans agreement for countries with low levels of EV deployment, and both these provisions will give a big incentive to Member States to support EVs. The large scale roll-out of EVs is necessary if we are to decarbonise our transport sector; it is a matter of if, rather than when, and at EU level the frameworks are being put in place. It is now up to Member States to show ambition in their National Climate and Energy Plans.

All of this makes our transport system more energy efficient, but it is important to also highlight that work is underway at EU level on other related actions which can also play an important part in this. The digital agenda has been one of the most important policy areas in Brussels in recent years as we have worked to move towards a Digital Single Market. The potential in this for improving the efficiency of the transport sector through digitalisation is clear and it is vital that the EU remains at the forefront of innovations that make our transport modes more connected and digitalised. Increased connectivity and greater automation of driving, for example, has the potential to make mobility safer, cleaner, more accessible and more efficient.

For this reason I welcome the Commission's "Europe on the Move" initiatives, particularly the significant related funding allocations that have been included in the recent proposals for the 2021-2027 Multi-annual Financial Framework. €300 million has been allocated in Horizon Europe for the development of automated vehicles, while €450 million has been allocated under the Connecting Europe Facility for the digitalisation of transport. If anything, these amounts could be increased, but it is a good start that I hope it can give a much needed boost to innovation in this area.

To conclude, it is clear that transport is a sector that requires policy attention. We have not seen the level of emissions reductions in transport that is needed, however I welcome the actions that are now underway, and look forward to finalising the outstanding issues in the coming months.

Making transport cleaner: Yes we can!



Didier HOLLEAUX

Executive Vice-President, ENGIE

In December, the EU Parliament and Member States agreed on ambitious targets for 2030 demanding a reduction of CO₂ emissions from new passenger cars and light commercial vehicles by 37,5% and 31% respectively. Negotiations on 2030 targets for trucks are not yet finalized but here as well, ambitious proposals are on the table.

Some say that these ambitions are not realistic. Some express doubts whether it will be possible to make the transport sector cleaner while serving mobility needs at affordable price and preserving industrial competitiveness and jobs in Europe. Indeed, the challenge is huge. But we can live up to our ambitions if we make use of a variety of complementary solutions, comprising alternative fuels, infrastructure investment, multi-modal integration, increased efficiency of the transport system through digitalization, etc.

A mix of complementary solutions is needed

In ongoing discussions, e-mobility attracts a lot of attention, both from those who would like to see it as the “silver bullet” as well as from its opponents. This risks to narrow down the debate, neglecting other solutions like biomethane. Biomethane is a renewable fuel that generates very low or even negative greenhouse gas and pollutant emissions. It can be produced from sustainable feedstock such as agricultural residues, organic waste or

manure, brings additional revenue to farmers and contributes to the circular economy. It can be blended with natural gas which allows for progressive development of green gas production. Biomethane is thus a key alternative fuel for new vehicles and also helps to increasingly decarbonize the existing fleet of more than 1.3 million natural gas vehicles in Europe.

Coupling the energy and transport sectors

The mobility of the future will be much more coupled with the energy sector and this is where the competencies of ENGIE with a strong position in power, gas and energy services as well as in urban planning and transport management, come into play.

ENGIE is a large investor in renewable electricity production and also develops electric vehicles charging infrastructure, together with our subsidiary EV BOX, a leading company with more than 60000 charging points installed worldwide.

While electrification will play a key role for cars and vans, it reaches its limits when it comes to long-haul heavy duty transport. There are not only technical and operational constraints related to the limited driving range, weight and charging times of battery-electric vehicles, commercial fleet operators are also very sensitive to higher upfront cost. A more credible and cost-effective alternative in this segment is natural gas, in compressed or liquefied form (CNG or LNG). Replacing diesel by natural gas has an immediate effect reducing air pollution. Thanks to the development of biomethane, it presents a significant greenhouse gas reduction potential. As major gas company, ENGIE invests also in natural gas filling stations via our subsidiary GNVERT, offering our clients either Natural Gas or 100% biomethane solutions. ENGIE has announced recently to mobilize 800 million EUR in the coming 5 years to develop green gas. We are supporting the sector's industrialization to reduce the cost of renewable gas by about 30 to 40% by 2030 and thus achieve cost parity with natural gas.

At ENGIE, we strongly believe in green hydrogen produced from wind and solar power via electrolysis. The beauty of hydrogen lies in its multiple use cases: Renewable hydrogen

can replace grey hydrogen used in industrial processes or it can serve as a storage option to integrate variable renewables in the energy system. In the transport sector, hydrogen can be used directly in fuel cell vehicles or serve as a basis for synthetic renewable fuels. ENGIE is involved in several projects including hydrogen for mobility, for example by developing the first hydrogen-powered bus line in France.

A favorable policy framework to enable the “mobility transition”

ENGIE is a leading company in the energy transition and we stand ready to become a key player in the “mobility transition” as well. To make this transition happen, we need an encouraging policy framework at European as well as at country level. Member States should provide visibility to investors in alternative fuel infrastructures, among others by stimulating the demand for cleaner vehicles and putting in place incentive programs, fiscal measures, etc.

At European level, the Clean Mobility Package will have a decisive impact on the types of vehicles sold on the market in the coming decade. It must refrain from “picking winners” and create instead a level playing field to allow for fair competition among different fuels and powertrains. The “tailpipe approach” to measure CO₂ emissions is inappropriate as it neglects greenhouse gas emissions from the production and transport of the fuel or electricity and the environmental impact of battery production. This approach is not technology-neutral but it creates a strong bias in favor of electrification. Being a large investor in the energy and transport sector, we know that it is too risky to put all one's eggs in one basket. Electric vehicles, natural gas, biomethane, renewable hydrogen – all these solutions will be needed and should be supported in accordance with their environmental and social impact.

Reforming road infrastructure charging in Europe



Revault D'ALLONES

MEP (S&D Group). Member of the TRAN Committee, Rapporteur for the Revision of the Eurovignette Directive

Almost 20 years after its adoption, the “Eurovignette” Directive, which regulates road charges - “tolls (distance-based)” or “vignettes (time-based)” - over more than 136,000 km of roads in the trans-European network, did not make it possible to achieve the objectives of the White Paper on Transport to move towards the full application of the polluter pays and user pays principles. Today, the Directive only applies to certain heavy goods vehicles and only about 25% of the trans-European road network is covered by distance-based charges (tolls), in accordance with the user pays principle. More over, only two countries, Germany and Austria, have introduced specific pollution-related road charges for heavy goods vehicles.

Towards greener charging

The revision of the “Eurovignette” Directive, which I have renamed “Euro-road charging”, is a turning point for the full application of the polluter/user pays principles. My report was approved on the 25th of October within a very specific political context following the adoption of the Paris Agreement of December 2015. While road transport accounts for 73% of transport emissions, without further action, CO₂ emissions from road freight are expected to keep rising, and we will fail to achieve the European Union’s climate objectives.

In this context, MEPs adopted several of my proposals aiming at including cars, buses and light commercial vehicles in the scope of the Directive and waiving all exemptions applicable to certain heavy goods vehicles. More precisely, the European Parliament proposes that from 2020 onwards the existing and new toll systems applicable to heavy goods vehicles over 7.5 tonnes will also apply to trucks under 7.5 tonnes, buses and coaches as well as vans carrying goods. MEPs also adopted my proposals to end the vignette system for heavy vehicles in 2023 and light commercial vehicles in 2028. These measures will ensure that by 2023 at least 50% of the European road network, compared to 25% today, will be covered by the user pays principle.

As regards to the polluter pays principle, MEPs adopted my proposals for the introduction of specific charges related to vehicle pollution levels (EURO standards) for all heavy vehicles in 2021 and all light vehicles, including passenger cars, in 2026. This is a very ambitious measure that will eventually allow for the application of the polluter pays principle to cover around 50% of the trans-European road network. Finally, MEPs also adopted my proposals for the introduction of mandatory variation of toll charges according to CO₂ emissions, especially in order to reduce toll charges by 50% for electric trucks and 75% for electric cars.

Addressing the need for investment in road infrastructure and the transition to clean mobility

My report was adopted in the context of a continuous deterioration of road infrastructure in Europe. The collapse of the Morandi Bridge in Genoa is a cruel reminder of the urgent need to invest in road maintenance and upgrading. My report highlights this urgency by earmarking the income from road charges to the transport sector. According to the Commission’s impact assessment, the measures adopted in my measures report should lead to a significant increase in the revenue from road charges of about 23.3 billion per year compared to the baseline scenario (if no reform is undertaken). This increase in revenue combined with the mandatory earmarking will make it possible

to leverage significant resources to finance the renovation of the European road network and accelerate the shift towards clean mobility. I am also convinced that this measure will strengthen the acceptability of toll systems in Europe.

The social dimension of road toll charges

The acceptability of the toll systems is also at the heart of the report. It was necessary to highlight the territorial and social dimensions of toll charges by charging differently, for the first time, frequent and occasional users on the outskirts of urban areas and in remote areas. This is a major step forward in enabling users, who have no choice but to use their cars daily to get to work, to be given a preferential rate compared to occasional users.

Next Steps

The adoption of my report marks a turning point in the European transport policy in order to better take into account the environmental and social impact of road transport in Europe. Without strong measures and a long-term vision of the evolution of road transport charging - which accounts for more than 70% of transport emissions - we will fail to address the climate emergency and the scourge of air pollution affecting our fellow citizens. I am now calling upon Member States to take their share of responsibility and translate into action the principles we have adopted in order to reach a final text by the end of the term of office.

European Battery Alliance: a concrete European industrial policy case



Diego PAVÍA

Chief Executive Officer EIT InnoEnergy

profound change, fueled by a rising number of Original Equipment Manufacturers (OEMs) announcing massive investments in electric mobility, and nudged by a strong political will. Focusing on one of the links of this chain, namely cell manufacturing, capacities are blooming across the world even though for now, the lead is taken by Asian countries, notably Japan, Korea and China.

Battery cells are sometimes considered as a commodity, implying that sourcing would be largely driven by the price. However, a battery cell is not a commodity: the performance not only depends on the type of cell (such as the chemistry or the design), as the quality of the manufacturing process and of the advanced materials employed could also impact the use.

For this reason, battery cells cannot easily be sourced anywhere as commodities. For complex products like EVs, where the battery itself could represent a quarter to a third of the final commercial value of the product, there is a clear incentive for manufacturers to have, at least, a geographical proximity with their cells' suppliers. **There is thus no doubt about the strategic imperative to develop domestic manufacturing capacities of sustainable batteries in Europe in this context of unstoppable electrification of mobility.** This is essential to support the European automobile industry and thus to maintain the corresponding direct and indirect jobs, but it is also an industrial opportunity to strengthen the competitiveness of Europe and facilitate the overall energy transition,

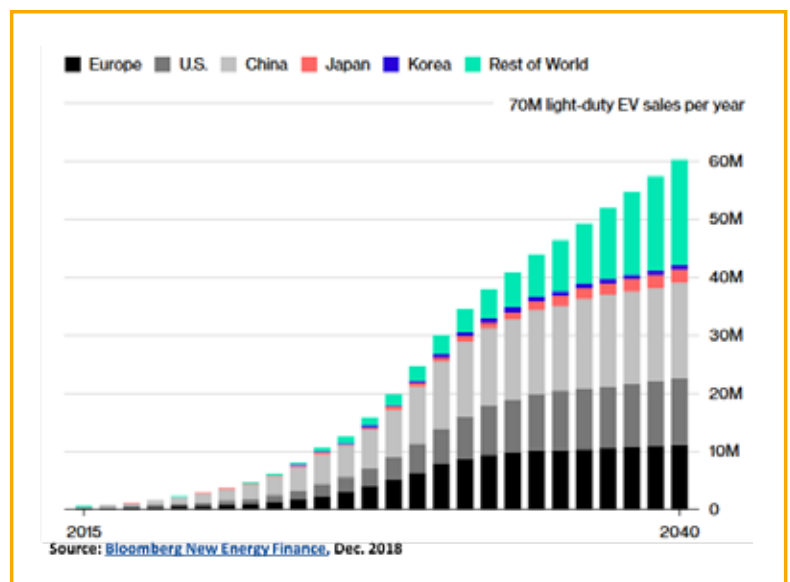
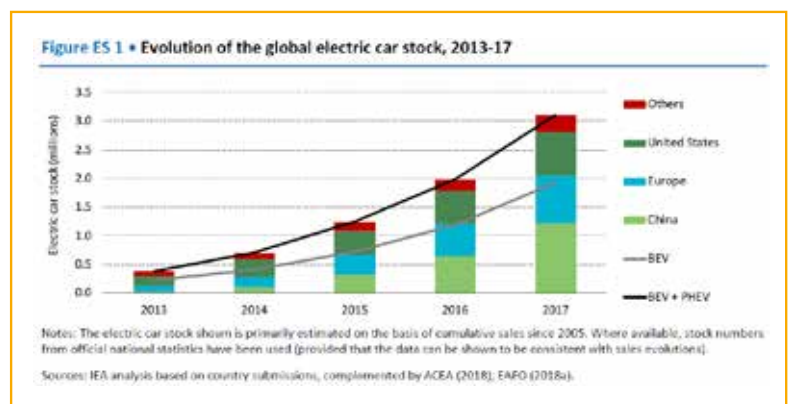
The European Energy landscape and especially its **electricity** dimension, is undeniably going through a profound transformation characterised by several trends, namely decarbonisation which also entails electrification of some energy usages, decentralisation, sector coupling, and digitalisation.

Although these trends are pointing into various directions, there is a common ground: **the core role to be played by flexibility in the future energy system.** In addition, the rising policy, regulatory and political **developments regarding CO₂ emissions standards** for light-duty vehicles and soon for trucks put more and more pressure on the internal combustion engine technology.

Pictured this way, **the context is very prone to the development of electrified mobility** and explains the fierce global competition to lead Li-ion battery storage, which is the essential technological bloc at the crossroad of electrified mobility, penetration of renewables, and decentralised energy system. Facilitated by the plummeting cost of batteries, this also explains the hockey-stick rising trend of Electric Vehicles (EVs) already observed over the past few years, which seems to be at its infancy (see Figure 1).

Adopting a broader view, **the entire battery value chain**, from raw materials (such as lithium, cobalt or Graphite) to recycling, is now getting prepared and engaged into this

Figure 1 – Evolution of the global electric car stock between 2013 and 2017 (IEA) and expected light-duty EV sales per year until 2040 (BNEF)



leveraging technological excellence and a strong industrial base on the European soil.

The European Battery Alliance (EBA) officially launched by Vice-President Maroš Šefčovič in charge of the Energy Union on October 11th 2017, intends to act as a call addressed to the European industry to seize the opportunity of a technology, namely Battery, that will be at the core of the energy transition. The main goal of the EBA is indeed to create the necessary momentum to support the European Industry in the field of safe and sustainable batteries which could amount to 250 b€ of an annual European market by 2025 (that covers the needs all along the value chain: power, transport and industry), and **make European champions emerge** as a credible alternative to North American and Asian players and **to eventually avoid the risk for Europe to become fully dependent on foreign batteries.**

Following-up the political launching of the EBA, **Vice-President Šefčovič gave mandate to EIT InnoEnergy to mobilise and steer Industry** towards the delivery of first recommendations on enabling framework conditions to create a **pan-European and cross-sectoral batteries ecosystem, capable of converting a technological leadership into competitive products and services.** These recommendations formulated by **the so-called EBA@250, the industrial workstream of the EBA led by EIT InnoEnergy**, notably contributed to the Strategic Action Plan on Batteries issued by the European Commission in May 2018. In practice, this process thus gave birth to a reinforcing and growing industrial ecosystem of stakeholders coming from the entire battery value chain and driven by the **shared ambition of making Europe one major stakeholder in the Batteries sector in the coming years.**



Vice President Šefčovič chairing a meeting on EBA at the 2018 EU Industry Days

On their side, **European car manufacturers have made clear their strategic move towards EV.** Among the various statements, let's mention Daimler, which will electrify 25% of its fleet by 2025; BMW will electrify 15% to 25% of its fleet by 2025, Volkswagen expects

to sell 2 to 3 million of EVs by 2025, Peugeot wants to shift 80% of its models to electric by 2023, and Jaguar expects to sell 50% of EVs by 2020. All in all, while more than 4m EVs will have been sold by 2018, BNEF forecasts that 28% and 55% of global annual sales of light duty vehicles will be EVs in 2030 and 2040 respectively. From a globalized economy's perspective, although Asian players seem to dominate the market with companies like LG Chem, Samsung or Panasonic from the manufacturing side, and OEMs such as BYD, **Europe is quickly ramping up**, with new European (like Northvolt) and foreign (like LG Chem, Samsung or CATL) investments being announced at a quick pace.

Beyond the positive signal these investments send to the outer world, it will also probably contribute to create domestic jobs, as manufacturing has indeed a fairly high labour intensity (21 jobs per m€ of Value Added for manufacturing in general, and 19 for manufacturing of motor vehicles¹). Analysts and observers forecast more than 1100 GWh of global manufacturing capacity of Li-ion battery in 2028, with 207 GWh (around 18.8%) in Europe (versus 13.4% in the USA), which is a different picture compared to the situation few years ago. Still according to analysts, the European manufacturing capacity of Li-ion battery may be insufficient to match the EV battery demand from Europe, which is forecasted at 400 GWh in 2027. So there is room for massive industrial investments, that will create the related jobs, with no tangible risk of overcapacities in Europe.

The EBA initiative has also remarkably helped identifying the main efforts to make in Europe. **It has created the suitable conditions to align, mobilise, orchestrate and provide extra visibility to the full set of EU tools and instruments in the hands of the European institutions**, from regulation, such as via the eco-design and battery directives, to Research & Innovation activities (i.e dedicated calls in H2020, creation of a European Technology and Innovation Platform (ETIP) on Batteries, partnerships of European regions active in batteries R&I etc.), or even skill-related activities such as the Erasmus+ Sector Skills Alliance dedicated to Batteries for electromobility. It can also leverage tools in the hands of the European Investment Bank which is ramping up on energy transition and notably batteries with the InnovFin EDP product.

In addition, **national and multilateral initiatives are also on-going in a very timely manner**, as illustrated by the recent declaration from France and Germany on a joint strategic plan to develop battery manufacturing capacities and corresponding expertise in Europe. In this perspective, Germany's economy minister Peter Altmaier made bullish declarations about the longer-term prospects for both EVs and European cell production, announcing that the goal was to cover around 30% of global demand for battery cells from German and European production by 2030, and demonstrating this ambition by stating that Germany alone would set aside 1 bn € to support battery cell production. France has also launched on January 2019 a call aiming to mobilize the national competencies on batteries, in the frame of the Franco-German initiative. Many other Member States, like Poland, Slovakia, Czech Republic, Sweden, The Netherlands, Spain etc. have also expressed a strong interest for batteries and are developing strategies to support industrial initiatives and attract investments.

Intergovernmental initiatives could be enabled and catalysed by the existence of an EU instrument to potentially benefit from State Aid exemptions: the Important Project of Common European Interest (IPCEI). **This demonstrates the complementarity and mutually reinforcing nature of the various initiatives supporting battery Industry in Europe taken at different levels and by various types of stakeholders, both from the public and the private sectors.**

To conclude, acknowledging that the electrification of mobility is not an option and that car manufacturers have clearly announced their ambition to move towards a new technology of powertrain, for competitiveness and employment reasons, Europe should host the largest share of car and battery manufacturing capacities. All in all, the coming years are decisive to ensure that this impressive political impetus created in 2017 by the creation of the EBA is effectively translated into an industrial momentum leading to socio-economic benefits for Europe. In these unsettled times, beyond the case of batteries, this political initiative kickstarted at EU level is outstanding and could be echoed to tackle an even broader challenge involving additional economic sectors: the energy transition. **The raison d'être of EIT InnoEnergy is precisely to accompany the energy transition, and we will keep on supporting these ambitions with enthusiasm and determination.**

¹ These figures appear in Hill, Nikolas, et al. "Fuelling Europe's Future: How Auto Innovation Leads to Jobs." Cambridge: Cambridge Econometrics (2013), referenced as coming from Eurostat, E3ME.

Polyolefin-based solutions are supporting the drive towards clean mobility



Maria CILIBERTI

Borealis Vice President Marketing and New Business Development

The automotive landscape is evolving more quickly and more fundamentally than ever driven by societal and environmental changes. We can help meet these challenges using new powertrain technologies, developing lighter vehicles, optimising energy management, and improving end of life recycling.

Durable plastics, including polyolefins – polypropylene and polyethylene – are an increasingly indispensable part of modern transportation, supporting the reduction of CO₂ emissions through their low density and lightweight. They are also inherently recyclable, ensuring a sustainable end-of-life performance. However, the use of plastics in vehicles is only the beginning: polyolefin based solutions address many of the challenges associated with both current and future mobility.

If we start with the vehicle itself, a basic principle applies: no matter the energy source, a heavier vehicle will need more energy to get from A to B. Energy consumption comes from a number of factors:

- Base electric load (heater, air condition, music system, etc.)
- Power to overcome aerodynamic drag or air resistance
- Power to overcome rolling resistance of the wheels
- Power to work against gravity when driving uphill
- Power for overcoming inertia in acceleration

Until very recently, each generation of cars has been, with a few exceptions, heavier than the one before. That is because carmakers continue to add more functionality, whether it be in the form of extra safety features, comfort, or infotainment. Weight saving is therefore increasingly important: when you save 100 kg of vehicle mass, the fuel consumption is reduced by approximately by 0.4 l / 100 km or by 10 grams of emitted CO₂ per kilometre. Therefore, decreasing the vehicle weight by 1 kg means 0.1 g/km of CO₂ emissions less or a penalty saving of 9.50 EUR (based on EU legislation mandating emission reduction targets for new cars in 2020 of 95g/km).

As society starts the transition to cars that gain some or all of their power from electricity, we are faced with the prospect of even heavier vehicles. The internal combustion engine may be taken out, but in its place comes an electric motor and, most importantly, heavy batteries. New Energy Vehicles (NEVs) all benefit from optimised use of electricity to maximise performance and increase vehicle range.

Polypropylene is the leading plastic for light weighting of vehicle parts on both the interior and exterior, substituting commonly used metals and more dense engineering plastics. When combined with novel technologies,

including lightweight fillers (wood or carbon fibre) or foaming of polypropylene, density reduction and related weight saving of up to 25% can be achieved, depending on the vehicle part.

Lithium-ion battery range is the key battleground in the NEV market. Polyolefins are an important contributor to improving their performance – and also their safety. They are used to produce microporous permeable membranes between a battery's anode and cathode, for example. Polypropylene films are also used in capacitors that transform the direct current from the battery into alternating current for the motor. Polypropylene is also being explored as a lightweight solution for many parts of the battery itself, including cell trays and housings. NEVs and traditional internal combustion engine vehicles can contain up to a kilometre of wires and cables of different types; halogen free polypropylene wiring solutions are a safe and high strength alternative across the operating temperature range of a NEV.

However, we also have to remember that NEVs will be dependent on the energy grid. Polyolefins today play a critical role in energy transmission, ensuring tomorrow's NEVs can be powered by clean electricity

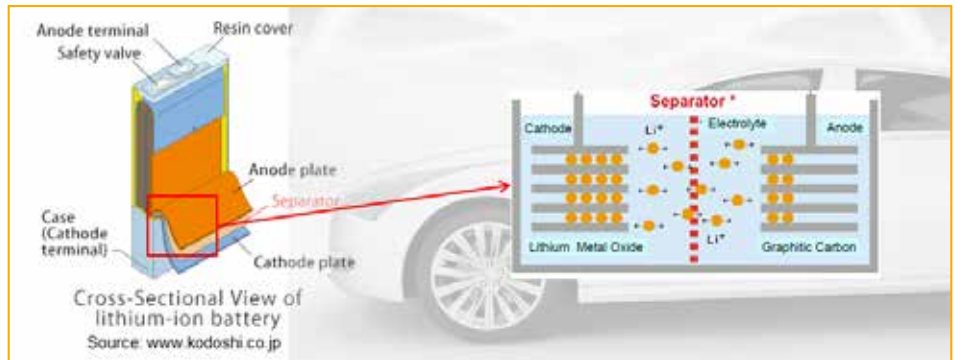


Polyolefins used in energy generation and transmission

from renewable sources like wind and solar. Offshore wind farms are increasingly further away from the coast, and hence sub-sea high voltage direct current power cables are an attractive solution. High purity cross-linkable polyethylene is the most effective insulator for long distance electricity transport (up to 640kV), with losses less than 3% over distances up to 1000 kilometres.

As the drive for renewable sources of energy to power NEVs advances, photovoltaic (PV) modules are another important technology. Again, polyolefins have a role to play: polyethylene solar panel back sheets and encapsulant films improve operational reliability, offering cost efficiency, extended lifetime, and a sustainable solution for PV modules.

For more than 50 years, polyolefins have played a critical role increasing safety and efficiency of transportation. As we move into the new and exciting mobility landscape, and address the challenges of climate change, the importance of polyolefins will only increase. Borealis is committed to developing value-creating polyolefins that enable our customers to think about the material science of transportation in a different way.



Polyolefins improving safety and performance of lithium batteries

Driving tomorrow


Lightweight


Aesthetics


Global expansion




**بروج
Borouge**

EDF plans to be Europe's leading energy utility in e-mobility



Médiatèque EDF – Crédit A Detienne

Yannick DUPONT

Group Head of Electric Mobility, EDF

Jean-Bernard Lévy, Chairman and CEO of EDF, unveiled the Group's Electric Mobility Plan on 10 October 2018. It aims to make EDF Europe's leading energy utility in electric mobility by 2022.

Interview with Yannick Dupont, Group Head of Electric Mobility since last November.

Electric mobility is a key component of energy transition

"The transport sector currently accounts for close to 20% of greenhouse gas emissions in Europe. With this in mind, we believe decarbonised electricity is the solution of the future for clean transport. Electric mobility will see robust growth over the coming years. This is clearly a societal issue, one that affects all citizens and that will be resolved in large part on a territorial level. What could motivate people more than the prospect of coming together to tackle a challenge as important as global warming and improving the quality of the air we breathe?

EDF previously launched its Solar Power Plan in December 2017 and its Electricity Storage Plan in March 2018. With this third Plan to support energy transition, the Group is reaffirming its goal of becoming the leader in carbon-free electricity production and in the development of new uses of electricity. Our aim in launching the Electric Mobility Plan is to become the leading energy utility active in this field by 2022 in our four main European markets: France, the UK, Italy and Belgium.

The time has come to support large-scale development of electric mobility in Europe

The environment is currently very favourable for such development. Growing public awareness is encouraging society, policies, regulations and manufacturers to move toward lower-carbon solutions. At the same time, investments are being announced in electric mobility, batteries and charging infrastructure. EDF first began testing electric vehicles in 1972. We were therefore among the pioneers in this field, thanks to our R&D! The road to developing electric vehicles has not been smooth by any means, but we believe that conditions are now right for this to quickly become a mass market.

Signals from institutions, citizens and the economy are all positive:

- The European legislative environment is favourable with the setting of medium- to long-term climate goals and, more recently, proposals from the European Commission calling for a significant decarbonisation of vehicles;
- A drive among territories, regions and cities to take the initiative in these areas;
- Strong public opinion: 83% of people in France believe¹ that electric mobility can help address the problems currently

being faced by urban areas, particularly air quality issues.

Our goals take account of this new vision of the market and our customers' needs

We intend to leverage our industrial capabilities and adapt commercial and technical offerings to pursue three objectives:

➤ Be the leading provider of electricity for electric vehicles in Europe by 2022

EDF and its subsidiaries intend to supply electricity for 600,000 electric vehicles, representing 30% of the market in France, the UK, Italy and Belgium. Starting in 2019, it will launch comprehensive offerings in each of these markets, including the supply of low-carbon electricity, recharging solutions for all customers with access to a parking space, and services to optimise the charging and use of vehicle batteries.

➤ Be the leading charging station network operator

EDF group will also be the leading operator of public and private charging infrastructure in its four core European markets. Through notably its subsidiary Izivia (formerly Sodetrel), the Group is working to deploy 75,000 stations and give its customers access to 250,000 interoperable terminals in Europe by 2022. Worthy of mention is the Corri-Door

¹ CSA – Survey on electricity's future as seen by the French, February 2018



fast charging network developed with support from the European Commission, which makes long-distance travel possible by ensuring that a station is available every 80 km. The expertise and experience that IZIVIA has acquired with E-VIA FLEX-E (thanks to the support of European Commission) can be leveraged in extending the Corri-Door network with two ultra-fast charging stations. Such projects allow us to develop solutions that guarantee cross border service continuity between Belgium, France, Italy and the UK. Lastly, we are developing innovative charging solutions for customers who do not have parking spaces, notably through an approach to innovation that involves collaboration between our R&D department and EDF Pulse Croissance, the Group's start-up incubator.

➤ Be the European leader in smart charging

Electric mobility will transform power systems, as an electric vehicle is also a battery that can be used to balance loads on the grid when demand is high. With the Electric Mobility Plan, EDF intends to take the lead in the smart charging market in Europe with a goal of operating 4,000 smart charging stations by 2020. European partnerships and financial backing from the European Commission have helped us deliver innovative solutions.

One key prerequisite for success: partnerships with innovative firms

A very large number of companies are involved in electric mobility. They are positioned at different levels of value chains that have until now been disconnected. But a new value chain is taking shape to address the environmental, industrial and commercial challenges we face today. EDF group is a driving force within this ecosystem of companies that is constantly growing and changing.

We have partnered with major players in the automotive industry, as well as with new entrants who are developing highly innovative solutions. Our partnership with Renault involves developing joint offerings and testing solutions in isolated areas and large cities. We are working with another major French equipment manufacturer on the battery technologies and charging solutions of the future and the development of mobility services. In England, EDF Energy and Nissan International have teamed up to jointly develop mobility, smart charging and second-life battery solutions. Our complementarity with a major Japanese car manufacturer is paving the way for new types of cooperation in smart charging and specifications for hydrogen charging stations.

Since 2014, EDF group via its fully-owned subsidiary Citelum has had a commercial and technological partnership with German start-up Ubitricity. The latter has developed an innovative solution that allows charging from streetlights, which is already in use in several countries in Europe and elsewhere. Citelum and Ubitricity have forged a strategic partnership to integrate this charging solution into Citelum's "smart city" offering.

Lastly, the partnerships created through EU projects have us working with the best industrial firms, SMEs and academics. There is no question that financial support from the European Commission is enabling the development of innovative Europe-wide projects.

I am convinced that EDF has everything it takes to succeed: 35 million customers who have placed their trust in us in Europe, a network of competent partners, a global mix that includes 87% decarbonised electricity and extensive experience with electricity uses. Timescales are long in the power industry. We are already laying the groundwork for the coming decades and anticipating the transformations that will be necessary to allow tens of millions of electric vehicles to move throughout Europe. Electricity-powered vehicles are one of the best solutions for tackling the climate challenge and supporting the energy transition in the transport sector."



Integration of renewable energy sources in electric vehicles



Petar GEORGIEV

Policy Advisor for Electromobility, Eurelectric

The source of electricity production

In 2017, the European power sector declared its clear commitment to decarbonise [well before 2050](#) and deliver the needed emission reductions for meeting the goals set by the Paris Agreement. A shift to renewables can already be seen throughout the continent with increasing number of countries relying on renewables as their [main source of electricity](#)

[generation](#)¹. Providing increasingly carbon-neutral electricity will in turn unlock the door to the decarbonisation of transport. Moving away from oil to electricity in transport is a pivotal step that will enable the **integration of high shares of renewables**, yield substantial **energy system efficiencies** and open up the field for **smart solutions and new business models** as electro-mobility develops.

As prices for renewable technologies continue to drop significantly, there is a strong expectation that more than 80% of electricity supply will consist of renewables [by 2045](#). With much higher capacities of variable generation, such as solar and wind, set to come online the transport sector offers a unique opportunity for facilitating such a high penetration of variable renewable energy. Allowing these clean MWh to be injected into the grids via smart charging operations makes electric transport a symbiotic partner. Along with this, battery electric vehicles (BEVs) enjoy the huge upside of having very high energy efficiency rate. Once their market scales-up, that feature will greatly reduce the total final energy consumption in the sector. Ultimately this will also

lead to the creation of various [employment opportunities](#) along the value chain.

When renewables and electric vehicles interweave

The power sector is currently leading a cost-effective transformation of the energy system, making it more responsive, resilient and efficient with a clearly defined role for transport within all this. Utilising the linkage between clean energy and transport is essential for proving an economic case for electric vehicles alongside their environmental benefits. In particular, BEVs can provide system flexibility services such as **demand side response** and **decentralised battery storage**. Such an addition of flexibility capacity removes volatility and is poised to bring significant energy savings due to consequent reductions in clean electricity curtailment and the ensuing incorporation of more renewables.

The integration of sufficient and clean power in BEVs requires adequate procedures for delivering energy to the recharging stations. Having surveyed the European charging infrastructure market, **operators of charging points largely select 100% renewable energy suppliers for their charging contracts**. In some cases, public tenders require delivering 100% renewable energy to the vehicles is a key

1 EU energy in figures, Statistical Pocketbook 2018, page 123

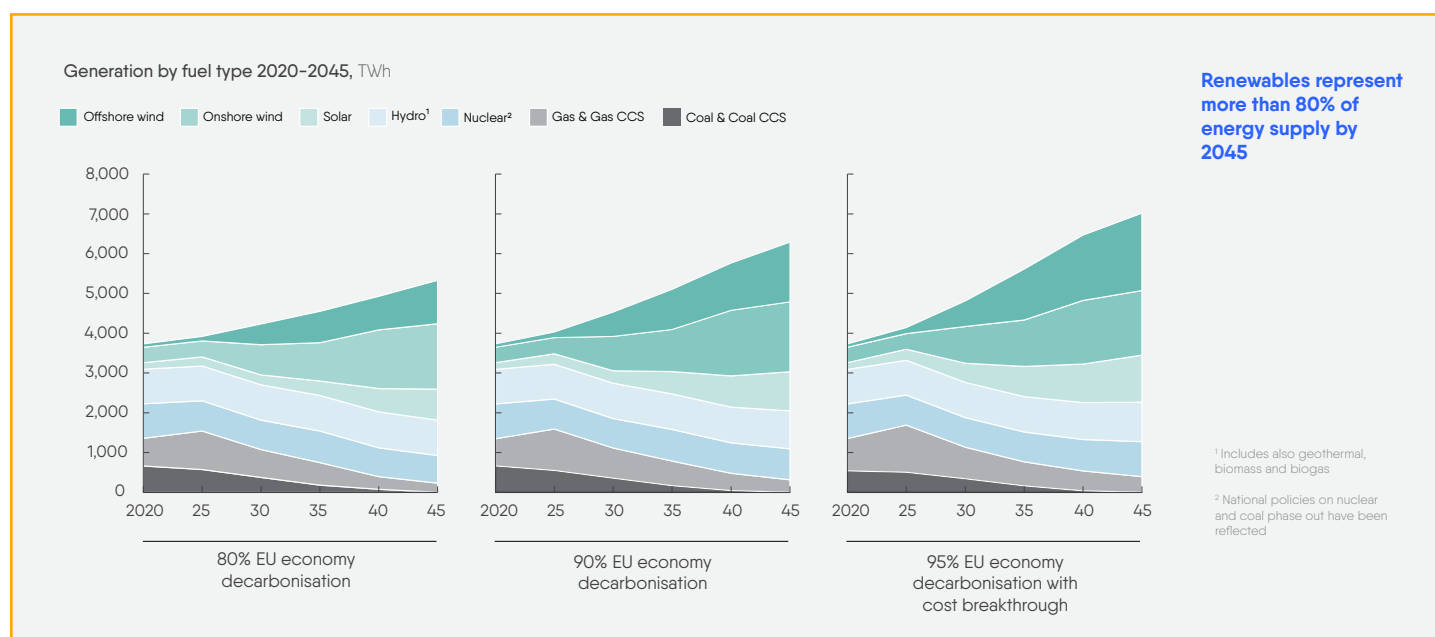


Figure 1 <https://www.eurelectric.org/decarbonisation-pathways/>

application condition. Another practices for supplying clean energy include issuing green certificates of origin or creating specific green tariff plans for customers.

There are also proactive ways to use renewables by maximising the utility of energy management systems and allow for adaptive charging habits, i.e. **smart charging**. Smart charging could be used to adapt the charging power to the renewable generation at that moment and the real-time wholesale market price signals. In addition, renewables are best integrated when vehicles are parked for a longer period **notably in buildings** – a great example being home charging stations with photovoltaic and storage options which maximise the energy consumed. Backing such existing technologies with suitable policy will allow for their wider market penetration and make electrification of transport an even more economically viable option, while fitting well into the general development of active customers and customer empowerment. This feature is expected to increase significantly going forward.

New opportunities

The emergence of electric vehicles has led to the creation of new actors – spanning from battery cell manufacturing and battery storage to charging point installation, operation and maintenance. This has created many new avenues for emerging business models and utilities becoming prominent actors in the provision of clean mobility – EDF, Enel X, E.ON, Vattenfall and Endesa amongst many. Most recently, the automotive industry also started making strides towards [providing clean energy for their electric vehicles](#). Both sectors are moving closer together with decarbonisation being just one of the catalysts. Massive trends such as digitalisation and artificial intelligence provide more fuel for potential business cases with the emergence of big data at the cross-section between energy and transport.

It is evident that electric driving will continue to blossom at ever faster rates thanks to market developments such as rapid decline in battery costs and the ongoing expansion of charging infrastructure. This will be brought about with commercial partnerships, which will increase battery production and allow

charging infrastructure availability. We will also see new examples of more granular cooperation between cities, real-estate actors, fleet owners, innovative businesses and local power companies.

With both energy and transport sectors being exposed to fundamental changes in the context of decarbonisation, digitalisation and consumer engagement, they are only beginning to connect. These growing interdependences are unlikely to recede – and much is to gain on both sides.



The role and place of hydrogen in today's mobility



Jorgo CHATZIMARKAKIS
Secretary General, Hydrogene Europe

All over the globe, leaders are looking at strongly addressing climate change. In December 2018 in Katowice, the COP 24 signed off the “rulebook” needed to bring the Paris Agreement to life which aims at keeping global warming well below 2°C compared to pre-industrial levels. The adopted guidelines package will be instrumental to encourage the uptake of actions fighting climate change. In this context, transport has a key role to play. Decarbonising transport is becoming a pressing challenge at European level as this sector accounts for the largest share of CO₂ emissions with 27%¹, a rising figure – unlike other sectors. In parallel, there is a growing pressure to improve citizens air quality with the European Commission opening infringement procedures towards some Member States for breaching EU rules on air pollution limits.

It is urgent to act now and fuel cell electric vehicles (FCEV) provide a solution to tackle the big challenges Europe is facing in the transport sector: decarbonisation and air pollution. FCEVs offer zero tail-pipe emission as well as allow for a driving style similar to conventional engines, with large range and quick refuelling time (less than 5 minutes), thus

no need to change drivers' habits. How does it work? Simple: a fuel cell is used to convert hydrogen in electricity to power the electric engine.

Several examples are already present in the transport sector throughout Europe showcasing the maturity of this technology.

Concerning cars, given the remaining high upfront cost of the infrastructure and of the vehicles, we see first fuel cell electric cars in captive fleets such as taxis. An example is the hype taxi scheme in Paris: over 100 taxis drive long hours without refuelling needs, no loss in productivity and the hydrogen refuelling station, located at the Paris Orly airport, is used optimally at full capacity – creating a business case for the infrastructure. The vehicles are also an excellent answer to growing new mobility types, such as private hire or car-pooling (e.g. CleverShuttle) and thus contribute to even further reduce the environmental footprint of private cars.

Hydrogen offers also an attractive rail passenger service solution like the Alstom Coralia iLint hydrogen trains that are today in commercial service in Lower Saxony, Germany. Hydrogen-powered trains are a clean alternative to the costly electrification of lines. This is particularly appealing in European countries with a low electrification rates. France, the United Kingdom, other German regions to name a few, intend to follow the path of Lower

Saxony and invest in zero emission silent hydrogen trains.

Currently, buses, coaches and trucks, represent one fifth of the road transport emissions² and are, so far, not regulated at European level. This will very likely change in the near future: regulating CO₂ emissions from heavy-duty vehicles will help drive zero emission vehicles forward. Hydrogen makes sense today in heavy duty applications: hydrogen trucks offer longer range and heavier payload, as they have a high energy density per weight. Fuel cell buses have a daily range of up to 400 kms and are currently being deployed across Europe. The JIVE initiatives³, co-funded by the Fuel Cell Hydrogen Joint Undertaking (FCH JU) under Horizon 2020 will deploy 300 buses in early 2020s in 22 cities across Europe, the largest deployment to date.

As of today, hydrogen is the most promising zero emission alternative for long haul trucks. Here as well, things are moving in the right direction. Just to name some of the latest developments: truck maker Nikola has announced very ambitious targets in term of vehicle mileage, number of vehicles and associated hydrogen infrastructure coverage and has secured over \$13 billion in pre-order

3 More on www.fuelcellbuses.eu



Alstom fuel cell train in Lower-Saxony, Germany

© René Frampe

1 and 2 : Source: National Emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism provided by the European Environmental agency

reservations for its vehicles. Additionally, Nikola is now moving into the Europe market as well with pre-orders from several EU countries (e.g. Benelux, Norway). Switzerland has just ordered 1,000 fuel cell trucks for the retailer company Coop. More and more manufacturers are joining the club and working on long haul hydrogen trucks and end-users are recognising hydrogen as a key alternative to diesel for long haul transport.⁴

Not only road and rail transport can be decarbonised with zero emission fuel cell vehicles. Considering that maritime transport account today for 2,5% of global CO₂ emissions and that these emissions are predicted to raise tremendously by 2050, there is a need to develop solutions powered with alternative fuels. While the Energy Observer, the first hydrogen-powered vessel is touring the world to demonstrate the readiness of the technology, maritime key players are looking

at hydrogen powered vessels from catamarans to large ships.

All of this cannot happen without the appropriate infrastructure. Today some 200 hydrogen refuelling stations are operational across Europe, while new stations continue to open almost every month. The support from the Fuel Cell and Hydrogen Joint Undertaking and the Connecting Europe Facility (CEF) has proved to be essential, while some stations are becoming commercially viable with a growing utilisation rate. This shows that the European Union is committed to enhance decarbonising solutions like hydrogen.

In the case of hydrogen this is even truer as not only it helps zero emission in transport but also in other sectors: Hydrogen is a bridge between sectors, fundamental part of sectoral integration. As Commissioner Arias Cañete stated recently “We are already in the process of developing a European Commission long term strategy to reduce greenhouse gas emissions. Hydrogen will be important to increase flexibility and we want to give a clear signal to industry that it makes sense to invest

in sectoral integration.”, showing, one more time, the crucial cross-sectors role hydrogen is playing and will play.

Hydrogen Europe

Hydrogen Europe is the European Hydrogen and Fuel Cell Association. It currently represents more than 113 industry companies, more than 68 research organizations as well as 13 National Associations. The association partners with the European Commission in the innovation programme Fuel Cells and Hydrogen Joint Undertaking (FCH JU).

For more information, please visit www.hydrogeneurope.eu.

⁴ See for example the “IRU vision for decarbonising commercial road transport leading up to 2050” published by the International Road Transport Union in November 2018.



Fuel cell bus in Bolzano, Italy

Clean transport, efficiency, mobility – as a service



Indrek GAILAN

Head of Transport Development and Investments Department, Ministry of Entrepreneurship and Information Technology, Estonia

Estonia, as one of the countries belonging to the European Union, faces the challenge of meeting the 2030 target to lower CO₂ emissions by 13% compared to 2005. So far, emissions from the transport sector have been steadily increasing and Estonia is no exception. The fact is, if we do not wisely steer our investments at the national level to develop infrastructure that would favour more sustainable modes of transport, we are unable to meet our climate goals - at

the level of Estonia, the European Union and the world. Despite the European Union's efforts to reduce greenhouse gas emissions in the transport sector, the sector's share of air pollution has so far grown. The reason why road transport emissions have risen is not that the vehicles have become more polluting, but above all because the vehicles are just moving more frequently on our roads. We take a lot more and longer trips. This trend is continuing. In the absence of real instruments to improve the situation, it is predicted that emissions will increase further compared to today. By 2030, emissions are projected to grow by 10%.

Train traffic is popular in Estonia

Since 2007, Estonia has modernized its national railways. In addition, a completely new train park was purchased in Estonia in 2014. New 18 electric Stadler and 20 new diesel trains. These changes have increased railway passenger numbers by 83%! Recall that in 2013 - 2014 the number of trips by train in Estonia in one year was 4.2 million. In 2018, it has already grown almost to 7.7 million passengers a year. This is a fantastic result and today we are faced with a situation where trains are already overpopulated during peak hours. It is very convenient to do everyday trips to work by train. The speed, honourable

quality of service and availability (tight schedule) are appreciated by the passengers.

Recently, the state initiated an additional measure for municipalities to build convenient access to the railway stations (new sidewalks, bicycle parking areas, recreational areas). The idea of the measure is to make access to the railway station pleasant, seamless so that the person would prefer this route by using a bicycle, hoverboard or walking. The project was so successful that two railway stops, the ones in Tartu and Keila, were recognized as nominees for the Landscape Architecture Award 2018. Great!

The national railway network has remained largely the same as it has been for the last few decades. It is a 1520mm Russian gauge railway. As an innovation, the plan is to build an electrified new Tallinn-Pärnu connection to Riga with a 1435mm railway (called Rail Baltica). This creates a completely new quality - in this case, Pärnu would be 45 minutes by train from Tallinn (the distance is 139 km). It's the same as going to work by car in a city nearby the capital Tallinn, which is 10-15 km away. Estonia is also analysing electrification of the existing 1520mm rail network. It would be an extremely large investment to the rail infrastructure, but it must be considered whether, in the 10 or 30 year perspective the investment is feasible reducing CO₂ in transport sector.





Is there a potential for cycling in Estonia or just a horrible climate?

In Estonia, cycling is the most underused mode of transport. The greatest potential for bike use is in cities. The city offers optimum distances for cycling, with distances of up to 5 km. For electric wheels, the distance could be up to 10 km. In any case, it is necessary to invest in the construction of cycling infrastructure in larger cities of Estonia if we really want to provide this alternative. It also includes storage infrastructure for bikes. In Helsinki, more than 10% of work visits are done by bike, in Estonia only 1-2%. Finland's ambition is to grow it further, so the ambition of cycling growth in Estonia should also be achievable. For example, the Italian city of Bari, with about 1.2 million inhabitants, decided in 2019 to pay a monthly fee of 25€ per month for people who prefer bicycles instead of cars. In addition, the city also financially supports the purchase of a bicycle. The motivation is really quite simple with such measures - people are healthier, less money is spent on infrastructure maintenance, and the air is also cleaner! In the future, the combined use of passenger cars must also be encouraged, focusing on changing the parking policy so that cars spend less time standing in the city, but the resource is used more efficiently (rent, sharing economy, co-operation, etc.). When sharing resources, it also comes down to the readiness of people to take up such services. At the same time, the changes

happen suddenly, like it was with the IT revolution or mobile phones.

The car is here to stay but robots take over our lives

As we can imagine, all of this is putting pressure on the slow down the road transport growth and contributing more to sustainable alternatives. Of course, cars will be more and more electric. But we must not forget that although we all can eventually have electric cars, the traffic jams in cities and the efficiency of using resources will not improve if we do not change the concept.

Testing of self-driving cars is possible on the roads and streets of Estonia from March 2017. This is allowed in a way that the car has a driver who can take over the vehicle if necessary. So basically the driver does not have to be in a vehicle but the driver has to have the ability to take control if needed. That kind of innovation in Estonian legislative system has allowed parcel robots onto Estonian streets. You can order food from the store and the robot will bring it to your home and your mobile phone alerts you when it is there. Quite nice but can it be even more? Yes! As E-Estonia (E- stands for digital) is currently participating in an international project that seeks comfortable mobility solutions for rural and city areas including concepts such as self-driving on demand transport.

Corrections in the modal shift and efficient vehicle management are necessary. The various rail, public transport and sustainable mobility projects contribute to this and, in the future, will integrate the concept of "mobility as a service". So be prepared to breathe cleaner air and test and try future transport solutions – it's going to be an awesome ride towards the future!

The transformation of our mobility – The role of alternative fuels infrastructure



Ismaël ERTUG

MEP (S&D Group), Member of the TRAN Committee

The transport sector is currently facing major upheavals. The incremental phase out of fossil fuels to reduce CO₂ emissions, the introduction of alternative, cleaner means of propulsion, and increasing automation and digitalisation will dramatically change both the industry and consumer behaviour.

Commitment to the goals of the Paris Agreement means a massive reduction in greenhouse gas emissions by 2050 and requires decisive political action in order to retain industrial performance and jobs while, at the same time, introducing innovative, greener technologies to the market. The interweaving of energy production and transport (sector coupling), which is most clearly visible for most people in electric cars, increasingly puts new demands on economy and politics.

Decarbonising mobility

For the automotive sector, climate goals mean that by 2050 only emission-free vehicles are licensed. The last cars with combustion engines will enter the market between 2030 and 2040, as the technology will then lose the cost advantages it still has. In the transition phase, the number of plug-in hybrids could increase dramatically, until battery-driven electric vehicles (BEV) and fuel cell-driven electric vehicles (FCEV) make up the biggest market share. For heavy goods vehicles, the most likely scenario for complete decarbonisation probably reached by FCEV-technology,

and synthetically or biologically produced gas. Batteries will be too heavy for the near future to accommodate the necessary range for HDVs of over 1,000 km. Synthetic fuels, particularly liquid or gas, is a viable solution for air and sea transport, as the power sources in these sectors are currently difficult or impossible to replace with batteries. As the energy balance of these fuels is very poor compared with the direct use of electricity, they should be produced as a by excess renewable energies. A technology-neutral but strict emissions legislation with a clear reduction path towards 2050 is necessary for all modes of transport in question. This is the most cost-effective way to reach the goal of decarbonisation, and new technologies will not be rejected right away. In addition, greater planning security increases acceptance from customers and industry.

A comprehensive infrastructure network for Alternative Fuels

In order to achieve the above outlined transition one important element is the European wide coverage of an alternative fuels infrastructure. This means primarily a rapid and consistent expansion of charging infrastructure. A functional network of hydrogen stations, however, is not least important. Overall, the 'quarrel' between the proponents of these two technologies turns out to be paradox. An electric engine is the heart of both powertrains, BEVs and FCEVs, regardless the source of the electricity. Thus, they do not substitute but complement each other. While BEVs are certainly the more reasonable option for daily use and vehicles that are mostly used for short ranges, FCEVs are the more convenient solution for heavy-duty vehicles. In addition FCEVs are a sound alternative to battery electric cars for commuters and people that drive a couple of hundred kilometres per day. Overall, a combination of both technologies, a so called "battery-fuel-cell hybrid", seems a reasonable objective to strive for.

While efforts have to step-up regarding the uptake of alternative fuels infrastructure around Europe, we also have to bear in mind that electric vehicles are not used in the same way as vehicles utilizing an Internal Combustion Engine. A conventional car is usually refuelled at a gas station whereas an electric car is often charged at home; there, the velocity of the charging process is secondary.

Nevertheless, charging stations are needed in cities, and fast or smart charging stations are urgently needed along European highways. We have already lost precious time. In 2014, I was shadow-rapporteur of the directive on alternative fuels infrastructure. Commission and Parliament had a quite ambitious goal for the year 2020. The Commission asked for around 800,000 publicly accessible charging stations across the EU. According to the *European Alternative Fuels Observatory*, there were only around 133,000 charging points operational in 2018. The council watered down an assertive proposal. In 2018, I was rapporteur for an initiative report of the same topic and managed to achieve an ambitious appeal to the Commission and Member states to step-up their efforts.

We still have some time to influence the transformation of our mobility and make it a successful story of economic prosperity, social advancement and climate protection. It should however be emphasized that a precondition for a positive outcome requires smart political regulation which should not driven by short-term interests, but rather being orientated towards sustainable solutions.

Together with my team, I worked on a thorough paper that reflects my view on the broader opportunities and risks of the mobility of the future. You can find it on my [Website](#).

Autonomous vehicles.

Legislation, opportunities and risks



Dario TAMBURRANO

MEP, (EFDD Group, MSS), Shadow Rapporteur "Autonomous Driving in European transport" (ITRE Opinion)

Autonomous vehicles, which are expected to be available in full driverless mode by 2030, will offer us a number of benefits, also by freeing us from sitting behind the wheel for at least one and a half hour every day. Nonetheless, they already raise important questions. It is thus pivotal to set an adequate legislative framework in the shortest amount of time, as we started doing at the European Parliament.

Only if legislators are able to neutralise problems, risks and uncertainties in time, we will be able to enjoy the numerous advantages offered by autonomous vehicles to the fullest, for instance by retaking the time that we are currently spending on driving and by greatly enhancing road safety, given that today 90% of the accidents are caused by human mistakes. Autonomous driving will also enable people with reduced mobility to travel by car on their own. Thanks to "smart roads", circulation will have much smoother flows, which consequently reduces pollution and emissions. The deployment of driverless buses and shuttles will also reduce the costs of public transportation, thus enabling the adequate service of smaller and isolated locations too.

Need a clear example of the problems to prevent or at least to limit before they emerge? Just think that autonomous vehicles need a software and an internet connection to function. While connection can break down

because of a blackout or of a banal rainstorm, both software systems and connections are hackable, and so will be autonomous vehicles. In a renowned experiment made by WIRED magazine in 2015, hackers sent off the road a traditional car via the connection of its infotainment systems - while a person was driving it! The more a vehicle is connected - and driverless vehicles will be very connected - bigger are the chances to hack them. Therefore, it is crucial to impeccably ensure their cybersecurity.

In addition to sensors and cameras, autonomous vehicles interpret reality through signals given by road infrastructures and other vehicles, i.e. the so-called "smart roads". A complex information exchange as such requires the use of ubiquitous 5G networks. An autonomous vehicle generates an enormous amount of data, thus being a matter of privacy - but not only. These data will indeed turn out to be fundamental to monitor traffic-generated pollution, to know whether new road infrastructures are needed or not, and to define responsibilities in case of road accidents. As it follows, it is crucial to establish where and how to store vehicle-generated data, as well as who can have access to it.

There is not much time left to find answers and solutions to the questions and problems related to autonomous driving. For instance, an autonomous shuttle carrying passengers between the train station and the industrial district is already under experimentation in Contern (Luxembourg), while driverless cars that are able to go wherever and in whatever traffic conditions are likely to be available in Europe by 2030. Regulators should avoid being caught unprepared. At the present day, EU institutions have made very general statements about this matter, e.g. the Amsterdam Declaration and the Commission's Communication on Connected and Automated Mobility, which is yet to be followed by legislative proposals. The European Parliament then decided to urge the Commission to do so by sketching its own political vision in the resolution "Autonomous driving in European transport", where I had the possibility to propose a number of political arguments that I felt compelled to put through. First, it is vital that humans have the possibility and the means to override

control of autonomous vehicles anytime. In my view, keeping humans in control of autonomous vehicles will be the key to their safe development. Otherwise, any unexpected event, any malfunction, any cyberattack - be it targeted or generalised - will leave somebody, or even entire societies, at the mercy of vehicles that cannot be started, stopped or steered. Autonomous cars could then become a real nightmare, as we could find ourselves facing the truck involved in the fatal challenge pictured by "Duel", the 1971 movie debut of the young Steven Spielberg, in which the truck driver is mysteriously never showed.

In addition to the centrality of human control, we should highlight the wide number of advantages offered by assisted driving, in comparison with the uncertainties related to autonomous driving. As a general rule, the development of autonomous driving should go hand in hand with that of sustainable mobility, in particular e-mobility and renewable alternative fuels. Vehicle-generated data should be anonymised and then made accessible to whomever the data owner should grant access to, including independent service providers.

Finally, I strongly believe it is crucial to protect local communities and passengers from the electromagnetic pollution caused by a constant, ubiquitous and powerful connection. This is especially true when it comes to extensive rollouts of 5G infrastructures close to sensitive areas like hospitals, schools, kindergartens and playgrounds, which should be bound to follow the precautionary principle. Local communities and public administration should always be granted with the possibility to choose about the deployment of 5G networks in their territories, a point that I have been advocating in a number of dossiers, regrettably without success so far. In January, the European Commission's SCHEER (Scientific Committee on Health, Environmental and Emerging Risk) stated that 5G technology leaves the door open to unintended biological consequences. We all want to improve our daily life, but we need to be smarter than the world we are shaping and be absolutely sure we are not giving birth to uncontrolled risks for unstoppable evolutions.

How to ensure that tyres are safe throughout their life?



Terry K. GETTYS

Executive Vice President, Research and Development, Member of the Group Executive Committee, Michelin

Why regulate tyre performance?

When it comes to vehicle safety, tyres mustn't be forgotten. Indeed, they represent the only point of contact between vehicles and the road. They also highly contribute to the environmental performance of the vehicle: up to 20% of CO₂ emissions of a car, and up to 30% of a truck are linked to what is called "rolling resistance" of the tyre.

Because of this major impact both in terms of road safety and environment, the EU has been at the forefront of tyre performance regulations, adopting regulations within the Union, and contributing to equivalent regulation at UNECE. Today, the General Safety Regulation (regulation (EC) 661/2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended thereof) requires that tyres placed on the European market must pass minimum performance requirements in terms of safety, measured by the wet grip performance of the tyre, of environmental performance, with maximum levels of rolling resistance, which translates into CO₂ emissions, and of rolling noise. These performances are defined by the equivalent UN regulation. With the implementation of this regulation in 2012, tyres that do not pass those minimum thresholds in terms of wet grip, rolling resistance and noise have been banned from the European market, contributing to the overall progress of the tyre market in the EU.

What is the performance of tyres when on the road?

European regulations have been very efficient in the progress of technology and improving the level of performance on the market, while ensuring a balance between environment and safety. However, there is one aspect that is not yet taken into account, which is the evolution of tyre performance with wear. Indeed, as soon as tyres are on the road, they start to wear, which affects their performance.

It is little known, but the environmental performance of tyres increases with wear: a worn tyre will emit less noise than a new tyre, and its CO₂ emissions will decrease. The improvement of CO₂ emissions of tyres can be estimated at around 20% throughout its life. That is why it is worth using tyres up to their maximum wear limit, in order to maximise environmental performance. The legal limit of a tyre is defined in the EU by a minimum tread depth¹, and can be measured thanks to indicators placed by the manufacturers – when they reach these tread depth indicators, tyres must be replaced for safety reasons. Indeed, there is one performance that decreases with wear: the wet braking performance of tyre, which is a safety indicator.

Real driving use capacity of tyres: what are the impacts?

We reach here a major question: how safe are tyres when in use? If the EU type-approval system, regulated by the General Safety Regulation, imposes the evaluation of tyre wet braking performance, tests are conducted on new tyres. Thus, tests do not take into account the evolution of wet braking capacity with wear. If all tyres see their wet grip performance decrease with wear, tests show that for some tyres, this performance decreases very quickly, while some will maintain a high level of wet grip capacity until the minimum tread depth. In other words, some tyres will need a much longer distance to stop on wet ground when worn than others. This difference in the evolution of wet braking capacity depends on

the design choice of the tyre, and cannot be derived from its performance when new.

This loss of wet braking performance can create anxiety for drivers who wonder if they should wait until they reach the minimum tread depth to replace their tyres. This situation has also led stakeholders from the sector to recommend, out of precaution, to remove tyres earlier than the 1.6mm minimum tread depth, for example at 3 mm. However, removing tyres earlier than the minimum legal limit cannot provide any proven performance, and thus be considered as a guarantee. The performance decrease depends on each tyre design, and there is today no information about the evolution of this performance. So early removal is not a solution: it cannot ensure a safety level, it has a cost for consumers who replace their tyres earlier than the legal limit, and it also has a cost for the environment.

Today, tyres are, in average, removed with a tread depth of 3 mm in the EU. While the difference between 3 mm and 1.6mm may appear negligible, it does in fact have a major environmental and societal impact. Should all drivers in the EU replace their tyres at 3mm instead of 1.6mm, it would translate into²:

- An extra tyre every two year per vehicle, with an extra 35% of waste and raw material produced, at a time where the need to limit our environmental impact on resources is more crucial than ever
- An extra 6.6 million of CO₂ per year (notably due to the fact that tyres would be removed from the road at the moment when they emit the least CO₂)
- More deforestation: since natural rubber is still used for passenger car tyres, the impact on rubber trees can be estimated at 5,700 hectares per year
- More use of primary energy, with an extra 32,800 Gwh consumed per year

These societal impacts are to be added to the safety one: an early removal does not ensure a performance guarantee.

How to ensure in-use performance of tyres?

Since there is an environmental interest in ensuring that each driver makes the best of his or her tyres, along with the need to have

¹ Directive 89/459/EEC "On the approximation of the laws of the Member States relating to the tread depth of tyres of certain categories of motor vehicles and their trailers"

² Source : EY report "Planned obsolescence is not inevitable", June 2017

tyres on the road that maintain an acceptable level of safety throughout their life, testing tyres at worn stage seems to be an imperative. If regulation imposed a minimum threshold on tyres at worn stage for wet grip, just like there is today minimum thresholds for tyres at new stage, it would mean that all tyres in the EU would have a maximum braking distance on wet roads. Drivers would be safer and be ensured that they can use their tyres until the minimum tread depth level, as all tyres would have been tested at this minimum level before being put on the market. Today, tests show that tyres whose wet braking performance remain high all along their life already exist, as the technologies to design such tyres are available.

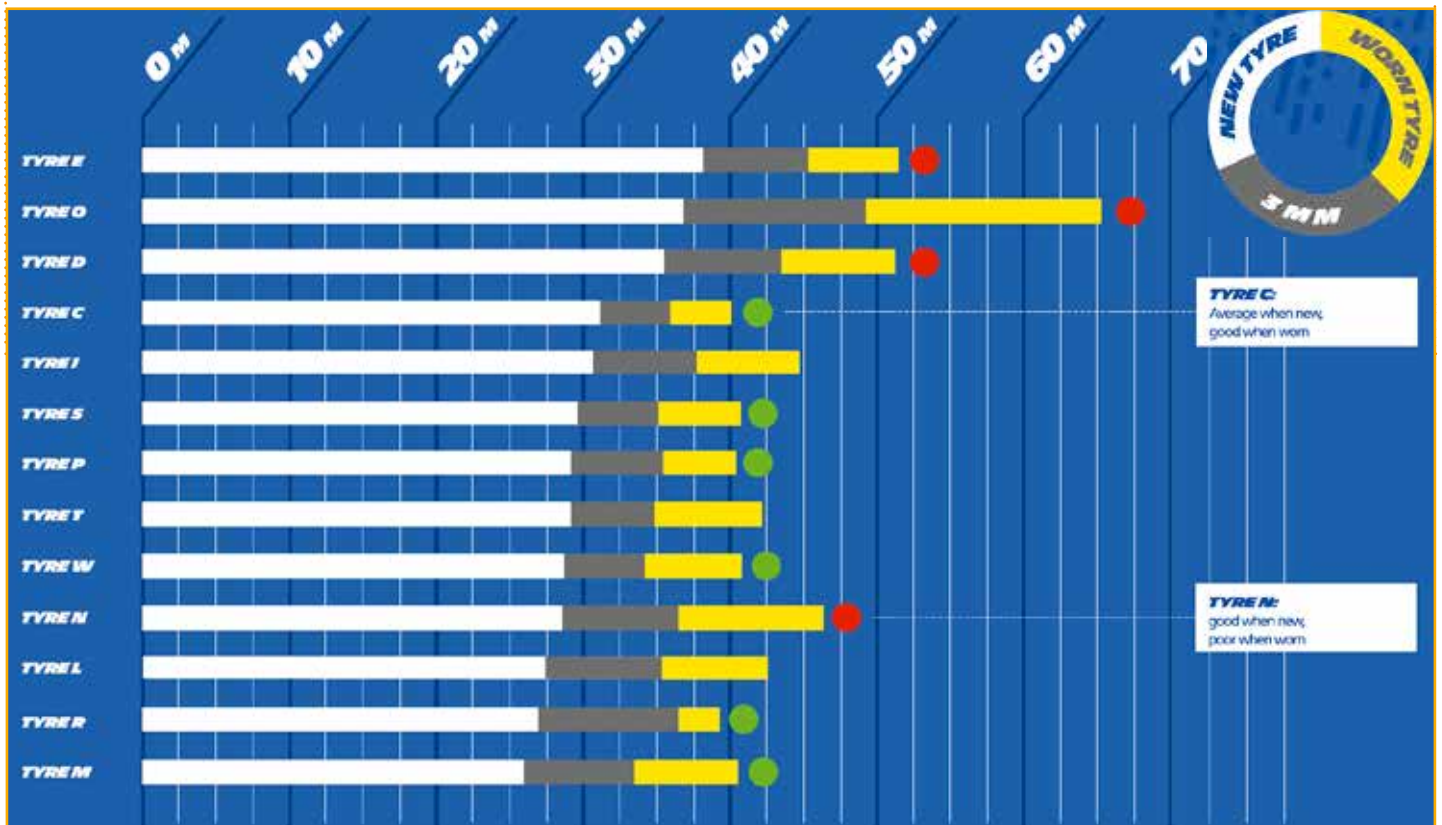
The need to ensure a minimum in-use performance, corresponding to a maximum braking distance capacity of a tyre is all the more important since vehicle technology is improving. Research shows that vehicle safety devices, with systems such as Automated Emergency Braking systems, aim at limiting the driver related safety factors. But when technology aims at neutralizing human mistakes on the road, the braking capacity of the tyres

is even more important³. As the General Safety Regulation is currently being revised, there is an opportunity to improve the level of safety provided by tyres in use, by introducing minimum performance thresholds based on tests **c** on tyres at worn stage.

As tomorrow will see automated vehicles on the road, knowing if your tyre brakes in 40 or 55 meters in the worst case will surely make a difference.

3 D. Christ, F. Goizet, Simulating the Relative Influence of Factors Relating to Forward Collision Accident Rates, Seventh International Symposium on Naturalistic Driving Research. Virginia Tech Transportation Institute Blacksburg, Virginia August 28-30, 2018

As test results show, tyre wet braking performance at worn stage cannot be derived from performance when new



Tests conducted by Michelin in 2016 following regulation (EC) 2009/661 test braking conditions on Michelin tyres and competition tyres representative of the European market.

Connected vehicles will enhance traffic safety and efficiency



Christoph GROTE

Senior Vice President Electronics,
BMW Group

Let's be quite clear about this, European road traffic safety policy is a success story! Road accident related fatalities have more than halved (2001- 2017), despite increasing traffic volumes. However, with 25,300 fatalities in 2017 a greater coordination of policy effort is needed for further significant reductions.

It is widely reported that over 90% of road accidents are attributable to human error. Assisting the human in the driving task is therefore a logical way forward.

Today's advanced driver assistance functions have the ability to further reduce accidents by 30% in our estimation. Those functionalities include forward collision warning, emergency braking, crossroads warnings or the usage of night vision devices, just to name a few. While introducing such innovations and increasing levels of automation the BMW Group and the automotive industry fully supports the strategy of the EU Commission to encourage the deployment of cooperative intelligent transport systems (C-ITS). C-ITS uses connectivity technologies to enable road vehicles to communicate with other vehicles, road users and roadside infrastructure. Communicating information such as approximate position, speed, direction of travel or time remaining on green for a traffic light can improve traffic efficiency by providing added value information to vehicle drivers. Aggregated C-ITS information also helps drivers optimize their journey and in some cases can warn of imminent collision thereby improving safety.

The transmission of C-ITS messages should be done via the license-free frequency band around 5,9GHz which is reserved for this purpose.

As of today there are two competing technologies being considered for communication in this spectrum band. Both technologies are not directly compatible.

1. The cellular technology is a new evolution of LTE, the so called LTE-V standard. This technology is able to communicate from car-to-car and / or from device-to-device even without existing network coverage and is a precursor of the 5G communication standard.
2. ITS G5 Wi-Fi technology (sometimes known as DSRC) accredited formally by IEEE for car-to-car and car-to-infrastructure communication.

The BMW Group will implement the Commission's hybrid technology strategy consisting of a cellular backend-based communication and short-range communication (in our case, LTE-V, 5G): we ensure that drivers get precise and validated information early enough, and all valuable information is distributed to relevant local participants. If there is an accident, warnings will occur 5km in advance, not just a few hundred meters before getting there. Thus, connected vehicles can significantly lower the number of accidents caused by human error.

Full exploitation of safety and efficiency benefits depends on the way information is shared amongst traffic stakeholders. We decided several years ago that safety-related C-ITS is not a differentiating factor between manufacturers – C-ITS information should be distributed to all relevant traffic participants to leverage its full potential. It is also one of our technological credos to build platforms that support innovation. That is why we base our technologies on the mobile communication technology with a central computer that can enrich the information and deploy to all cars. The larger the central database platform, the better the service and the greater the potential for innovation. We can foresee swarm intelligence or crowd technologies where all cars are sources of information. For example, if you want to warn about dangerous stretches of road, the larger the number of vehicles that see the road, the better the coverage of incidents.

We started implementing the BMW Group connectivity approach in 1999, and are still

cited among the leaders for connected vehicles and infrastructure with more than 13 million connected cars on the road. The Commission is aiming for an introductory phase of C-ITS deployment by finalising a delegated act from the ITS directive in 2019. BMW and other manufacturers have already implemented many of the foreseen 'use cases' using systems that are technically interoperable and based on OEM's and independent infrastructure standards. We will implement all informative use-cases by end of 2019.

Network-based, cellular technology is the backbone of our communication today. Since the mandatory implementation of the eCall service, every new vehicle must have an integrated SIM card. Synergetic use of this SIM card will enable communication of C-ITS information from vehicles to a web-based backend structure which in turn enables a target-oriented traffic data accumulation. Optimized data accumulation is needed for efficiency measures such as congestion modulation, information for establishing emergency lanes, signage of free parking spaces etc.

In addition, there is direct communication between vehicles, which does not need network coverage. The LTE-V standard for high-speed wireless allows vehicle-to-vehicle, people-to-vehicle, **and** vehicle-to-network communications over existing networks. It is backwards compatible and follows the principle of efficient use of spectrum. In its peer-to-peer communication mode, designed for time-critical communication on the dedicated license-free 5.9 GHz frequency band, it is superior to competing direct communication based on elderly Wi-Fi technology. This is why China, for example will leapfrog Wi-Fi technology and go directly to LTE-V.

The license-free 5,9GHz frequency band must therefore be totally technology agnostic. Any technology predetermination today, would automatically decrease the potential of the other technology. We are of the opinion that the preferential treatment of the Wi-Fi technology in the 5,9GHz frequency band in a C-ITS Delegated Act would lead to a massive legacy. Market forces alone should decide, which technology is future-proof and would pave the way for improved safety and efficiency in the road traffic sector.

Towards safe, connected and clean mobility in our cities



Anna Lisa BONI

Secretary General, EUROCITIES

Europe's major cities play a crucial role in the transition towards cleaner and safer mobility. Digitalisation – together with the introduction of new mobility services and clean vehicles – creates opportunities for local authorities to reduce transport emissions and improve accessibility, efficiency and public health.

A sustainable transition

Many European cities are setting international standards in the transition towards sustainable urban mobility. Copenhagen, for example, is well-known for its high share of bicycle trips, Amsterdam and Oslo for their e-mobility strategies, Stockholm and London for tackling congestion, and Paris, Barcelona and Madrid for their ambitious public space projects. Milan is a champion city in the field of shared mobility and low emission zones, while Vienna has put an ambitious strategy in place to further stimulate public transport use and walking. This is, of course, only a limited selection of what European cities are doing to support the transition towards sustainable urban mobility.

Developing a sustainable urban mobility strategy requires long term thinking and a joined-up approach that brings citizens and other stakeholders onboard. As local authorities we are committed to promoting public transport, cycling, walking and shared mobility solutions, as well as reducing car lanes, on-street parking and developing charging infrastructure for clean fuels. Further actions, such as creating urban freight consolidation centres, last-mile

delivery by cargo-bike and e-commerce pick-up points, can reduce the growing number of vans and light duty vehicles on urban roads.

A wide range of measures, such as support from the EU's Urban Mobility Package and strong political leadership help make this possible. By connecting city administrations, EUROCITIES, the network of major European cities, helps to further develop these goals and improve the quality of life of people across Europe.

Digital opportunities

Digitalisation, connectivity and automation are expected to revolutionise urban transport. As local authorities and traditional transport operators are increasingly challenged by disruptive, digital platform services offering ride-sharing, free-floating bicycles and scooters and routing advice for car-drivers, it is important for cities to remain the 'conductor' of the urban mobility orchestra. With the arrival of 'Mobility as a Service' (MaaS), urban travellers will increasingly be able to choose from a menu of different travel options, using one app to plan, book and pay for their trips.

Although these new mobility services have a clear potential to reduce car use and ownership, they can also generate unwanted effects. Recent studies suggest that – without proper regulation at local level – ride-sharing can reduce public transport use and create additional car traffic, resulting in more congestion, emissions and accidents. The introduction of free-floating public bicycles and scooters also create controversy as very often cities are not properly consulted before the actual deployment. Although cloud-based, real-time navigation services help drivers to avoid congestion, they can also direct traffic to residential roads that do not have the capacity to accommodate through-traffic.

To get the most out of new mobility services, they should be deployed in conjunction with local authorities, for example through the development of a public-private contractual partnership or a memorandum of understanding. By doing so, they can be properly integrated in a sustainable urban mobility plan, compete on a level-playing field and contribute to the wider policy objectives of improving people's lives. In return, cities should have access to certain datasets that help them to better plan

and monitor the transport system. Experiences in Lyon, Stockholm and Torino have demonstrated that, when integrated in a wider urban mobility data platform, open transport data can feed into advanced traffic management services for passenger and freight traffic, improve real-time multimodal apps, and create new business opportunities for local start-ups.

A cooperative, connected future

Although transport automation is still at an early stage, driverless technology is developing at a fast pace and cities are preparing to tackle the challenges and maximise the benefits of cooperative, connected and automated vehicles (CCAVs). The interests of citizens must be protected in this revolution, which is why EUROCITIES is supporting a series of public debates on CCAVs in cities across Europe in 2019, to bring the views of citizens directly to EU decision-makers. As city authorities, we believe low-carbon CCAVs can support the objectives of local sustainable urban mobility plans towards better quality of life, provided they complement high capacity public transport services and stimulate shared, multimodal travel.

To achieve this outcome, more city-focused research and pilot schemes are needed to address knowledge gaps and further test the roll out of automated vehicles in urban areas. It would also be important to link city authorities, industry, operators and other stakeholders by establishing a platform at EU level.

Another aspect to consider as we plan for a sustainable future is safety. On average, more than two-thirds of fatalities in urban areas are pedestrians or cyclists. As speeding cars are a major cause of accidents, cities across Europe – including Lisbon, Ljubljana and Ghent – have introduced and expanded 30km per hour zones and pedestrianised areas and stepped up efforts to enforce speed limits by restricting traffic, redesigning road infrastructure and installing speed cameras. With this in mind, we strongly support current European level ambitions to make intelligent speed adaptation and advanced emergency braking standard features in future cars, as well as measures to increase truck drivers' visibility from their cabins.

There are many opportunities at hand as we speed towards the urban future, but taking our time to consider these is our best route towards a sustainable tomorrow.

www.eurocities.eu

Unlocking the potential of digital mobility



Sigrid DE VRIES

Secretary General of CLEPA, the European Association of Automotive Suppliers

Individual mobility, today, can be considered a fundamental element of our civilisation. Yet major changes are underway that will reshape how we consume mobility and that are poised to deeply transform how cars are made, sold, owned, and used. “Traditional” individual mobility may progressively withdraw in favour of mobility as a service.

These major changes are brought about by three main drivers: connectivity, electrification, and automation. Studies expect up to 70% of the EU’s fleet to be connected and pure battery-electric vehicles to comprise 6% of the fleet by 2025, while we would see a variety of different powertrains and fuel types for all kind of mobility needs.

A new world of opportunities...

As mobility is a key part of our lifestyle and economy, this future offers an enormous potential for societal improvements while reducing the impact that transport has on our environment, and it also opens new opportunities for mobility stakeholders.

Mobility will become more accessible, especially for disabled people and the elderly, and will help keeping an ageing society mobile longer. Mobility will also become more efficient, with less congestion in cities and urban areas thanks to technologies which change the way we drive and steer the traffic.

Safety will improve significantly. Currently, 94% of accidents involve human error. We believe that the European Commission’s “Zero Vision” objective (zero road fatalities by 2050) is achievable, and digital technologies are a major part of the solution along with the other technologies, such as those set to become mandatory in all new cars thanks to the General Safety Regulation.

Mobility is on track to becoming CO₂- and pollutant-neutral, and this trend will only accelerate through the rapid introduction of already available emission-reduction technologies, such as particulate filters, advanced exhaust treatment, design changes, as well as innovative solutions like e-fuels produced from renewable energy. Electrification of the transport sector will of course make a significant difference, although it will not be the solution for all mobility needs and modalities.

A new market of mobility services is already emerging, extremely diverse in its makeup given the wide range of the technologies and their uses: software and content, data, retrofit solutions, remote diagnostics, information and entertainment offers, concierge services, additional driver assistance offers, over-the-air activation of existing vehicle functions for a fee, fleet management services, advanced car-sharing schemes, and many more. Many new players are entering this anew market – or markets – as it represents new opportunities for business and job creation, not to mention the spill-over effects that can be expected on other sectors, such as semiconductors, mapping services, or processing technologies, to name only a few.

...With some obstacles on the way

On the other hand, such important changes will also present many challenges and carry certain risks, which will need to be addressed if Europe is to make digital mobility a success and contribute to building a European data economy.

Among the top concerns in the face of transformative change is the question of consumer acceptance for the new technologies and the way they will transform how we consume mobility. This is especially true with regards to automated driving, where societal acceptance will rely on ensuring the drivers’ trust and

safety and on solving the complex issue of liability.

Similarly, citizens are understandably concerned about their personal data in an increasingly connected world. Mobility can greatly benefit from connectivity and the use of in-vehicle data, but drivers should always be fully aware of what data is collected, by whom, and for what purposes. They should feel confident that they are in control of their personal data and that their cars provide a high level of cybersecurity as well.

On the business side, data will be the “key enabler” for an overwhelming number of new and innovative mobility solutions. Any limitations in availability or access to data for all market participants will result in an underutilisation of the EU’s innovative potential, not to mention the risk of harm to competition on the internal market.

When it comes to improving congestion and reducing emissions, new technologies will be an essential part of the solution. But they may also become counter-productive if we do not take care to implement them in the right way. A self-driving electric car that must return home to recharge after driving its owner to the office will only make congestion worse and increase energy consumption, for example.

This implies making the necessary investments to develop and upgrade our infrastructure. It means ensuring that a physical and digital infrastructure is in place which allows the implementation of the new technologies necessary for connected and automated driving. It also means cross-border coverage and sufficient bandwidth in communication networks, for example ITS-G5 or 5G. The legal infrastructure should not be forgotten here: we will also need a harmonised legal framework for connected and automated driving in all Member States, to prevent the market from becoming fragmented. This concerns in particular the harmonisation of traffic regulations, product liability directives, and motor insurance regimes.

Emission reduction measures must also be done right. Electrification is not an all-in-one solution to environmental issues. The ecological impact of battery production

should be taken into account and a recycling system implemented to support the circular economy. Furthermore, electrification cannot solve the needs of some transport modalities (long-haul transport of goods, for example) and we must leave room for other solutions to emerge as well.

Finally, we should not ignore the inevitable disruptive impact that these changes may bring to existing business models and employment. Many jobs are potentially concerned, not only in production chains but also on the user side, e.g. professional drivers threatened by automated cars or trucks.

Automotive suppliers have an important part to play...

The European automotive supplier industry, which CLEPA represents, has a central part to play in this transformation. Suppliers are embedded across the value chain and provide – or are developing – all the technologies and solutions related to the new services mentioned above. With a 20-billion-euro R&D footprint annually, suppliers are the automotive sector's principal source of innovation and we will be, tomorrow more than ever, the sector's solution providers.

Suppliers are also becoming mobility service providers in their own right. We are moving away from a market structure where car manufacturers are selling products and suppliers simply providing components and software for those products. For example, automotive suppliers are increasingly being asked to provide comprehensive fleet management solutions.

Already, suppliers invest massively in new technologies, especially on powertrains, automation, and connectivity and will need a return on investment. This implies that the infrastructure and regulatory framework

be put in place quickly, as this will provide certainty to investors, encourage further investment, and ensure that Europe keep its global leadership and competitiveness.

...And so does the legislator

Furthermore, to support this ambitious vision and help unlock the potential of digital mobility, an adequate regulatory framework is required.

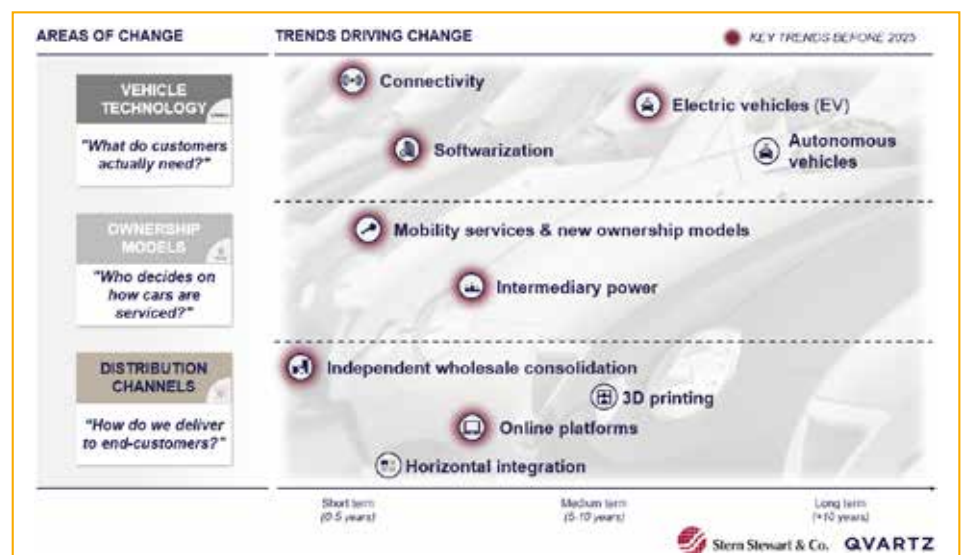
First of all, a truly competitive and innovative market can only develop if competition is fair and undistorted, and European regulators should ensure that all the necessary measures are in place to guarantee this. This is especially true when it comes to data: all market participants must have fair and equal access to in-vehicle data and resources. Through a combination of competition enforcement and legislation, the EU must set up a framework that will avoid monopolistic structures from the beginning, thus utilising the full innovation power of all existing and future market participants.

The EU is also uniquely placed to enforce high minimum safety standards for all new vehicles on the European market. It already has an excellent track record, and it must continue to be a global leader in this field in the future as well. Suppliers continuously develop new innovative technologies – and improve upon existing technologies – that help reducing accidents or minimise their damage and the EU should consider mandating them without delay as soon as they have demonstrated their benefits. Advanced emergency brake assistance, lane-keeping assistance, alcohol interlock devices, and driver drowsiness monitoring are just a few examples of technologies that will contribute to saving many lives on our roads on our way to zero fatalities by 2050.

In a similar way, the EU should set up a framework allowing for the fast implementation of new technologies related to automated functions, as well as driving standardisation and harmonisation in connectivity, communication, and spectrum. Everyone agrees that partially or fully automated vehicles are set to become mainstream in the future, but it is essential that a favourable environment be established now, as this is what will justify further investments. There is still room for the EU to claim international leadership in the field of automated driving.

In parallel, ambitious R&I programmes will remain necessary to further boost investment in all the facets of digital and green mobility. There are many research areas that would greatly benefit from EU support; to name only a few: artificial intelligence, data transfer and management, cybersecurity, intermodality and hubs, traffic fluidity, parking management, charging and grid integration, alternative fuels, ultra-clean powertrains, etc. Ideally, this would be coordinated under an overarching public-private partnership in road transport.

Finally, the EU will have a role to play in addressing the potentially disruptive effects of the transformation of mobility. Through programmes encouraging job creation and transfer, and especially skilling and reskilling, Europe must ensure that this future does not leave citizens, workers, and regions behind, at the risk of causing further polarisation in an already divided EU. The transformation of mobility opens up many opportunities to make Europe a better place to live in, but it is up to all of us to make sure that everyone can reap the benefits.



A milestone for mobility in Europe



Markus SCHLITT

CEO Intelligent Traffic Systems, Siemens Mobility GmbH.

With the adoption of the C-ITS Delegated Act, the European Commission has set the course for well-coordinated development efforts in the area of Vehicle2x communication and hence for the smart digitalization of Europe's road network. The key benefit of this innovative communication technology, which allows vehicles to communicate with each other and the traffic infrastructure, is a significant improvement of road safety.

Mobile society is in for a paradigm change, maybe the biggest one since the first Ford Model-T rolled off the conveyor belt in the early 20th century. Cooperative, connected and automated mobility opens up completely new opportunities for increasing safety and efficiency in traffic. On the technological level, the path to automation and digitalization is virtually clear already today. What the innovative players need the most now are well-defined regulatory frameworks that ensure that all stakeholders will pull together – preferably always in the same direction.

One such framework has now been created by the European Commission: the C-ITS Delegated Act. In unison with other important players in this field, Siemens endorses the contents of this Act since they will facilitate the large-scale deployment of cooperative traffic systems. The decisive benefit of Cooperative Intelligent Transport Systems (C-ITS) is that

they will make traffic on Europe's roads safer and more efficient - besides improving the flow of traffic and reducing traffic-related pollutant levels, not to forget their important role for the further development of autonomous vehicles.

C-ITS are networks of vehicles and smart infrastructure using defined communication channels to exchange, almost in real time, information on traffic and environmental conditions, e.g. on congestion and roadworks or traffic-relevant hazards. C-ITS applications will be implemented on public roads and serve a public purpose. This is why they need to operate as a separate communication ecosystem where each and every C-ITS station can communicate with any other and the connected vehicles, independent of geographical borders, technologies and manufacturers. What is more, the Delegated Act will also help clear the path to the trouble-free coexistence of C-ITS applications with the large number of electronic tolling systems already deployed in Europe. This is essential since the digital tachographs for tolling will only work reliably in an interference-free environment.

In essence, Siemens and other companies involved in this technological field have four top priorities that are now being addressed by the C-ITS Delegated Act:

➤ Interoperability

For truly significant progress in terms of road safety, the vehicles and the road infrastructure elements need to use a common, uniform language to communicate in the dedicated exclusive frequency band and without interferences. A fragmented C-ITS market would constitute a serious obstacle to this.

➤ Backward compatibility

Funds spent on C-ITS are long-term investments, in parallel to the life-cycles of roadside infrastructure. Hence investment security is crucial, for vehicle and infrastructure providers as well as for vehicle users. Backward compatibility ensures trouble-free communication between older and newly registered cars within the networked systems. Also in future, this safety-relevant technology must not be to the exclusive benefit of new car buyers.

➤ Compatibility

C-ITS applications need to be compatible among each other. But it is equally important that they do not interfere with the radio communication required for communication between the electronic tolling systems installed on nearly 50,000 road kilometers across the EU already and the mandatory digital tachographs in the trucks that use them.

➤ Security

C-ITS applications require a cybersecurity infrastructure allowing every C-ITS station to check if a transmitting C-ITS station is authorized to communicate within the specific ecosystem and if the relayed information is credible and approved. This system needs to cover all vehicles and road infrastructures within the European Union, regardless of the individual country, traffic management system, vehicle brands and communication technologies involved in each individual case.

In the view of the market- and technology-leaders in the area of C-ITS, the Delegated Act of the European Commission follows the hybrid-communication concept as set out in the 5G Action Plan COM (2016) 588, i.e. the combination of the already existing short-range communication technology ITS-G5 (IEEE 802.11p) with two cellular communication technologies: 4G, which is already in use today, and the emerging 5G technology. It clearly reflects the ITS Directive 2010/40/EU and applies exclusively to players planning to deploy C-ITS use cases.

The companies active in the C-ITS market are convinced that the Delegated Act creates precisely the kind of legal certainty needed to allow the deployment of the corresponding innovative applications in the shortest possible time and with maximum geographical coverage. It will also enable fast market entrance for new and mature technologies and is able to keep pace with the latest technical developments.

A special merit of the Delegated Act is the blend of visionary spirit and pragmatism reflected in its clever approach to the issue

of communication standards. It leaves room for realizing the vision of an integrated use of ITS-G5 according to IEEE-Standard 802.11p and radio-based Vehicle2x communication (C-V2x). ITS-G5 is a mature technology for Car2x applications in the 5.9 GHz band: It serves as the basis for safety-relevant short-range communication, prepares optimally for the system redundancy required for the higher stages of autonomous driving, and is already implemented in most of the ongoing projects in the EU.

5G can improve the communication link to the traffic control center and the automobile cloud solutions, but only if new base stations are built. ITS-G5 (802.11p) would also require a new infrastructure, which could however be implemented on the basis of existing structures.

From Siemens' perspective, the Act comes at just the right time: The digitalization of our roads and streets is already in full swing. In the future, connected cars will warn each other of potential hazards such as accidents or black ice. They will know about the location of roadworks and the switching phases of traffic lights and be able to react accordingly. The drivers will benefit from safer, more convenient and faster travel – with lower emissions. For this, situation-relevant information about coordinated green phases, congestion, roadworks, wrong-way drivers etc. must be made available directly inside the car, in urban traffic as well as on the motorway.

More information means less congestion and fewer injured. Experts from the German Association of the Automotive Industry (VDA) are convinced that connected driving will reduce congestion in Germany by 20 percent, and that 5 percent of road casualties

could be prevented by the “weather hazard alert” function alone, which warns road users of dangerous conditions such as torrential rain, black ice and crosswinds.

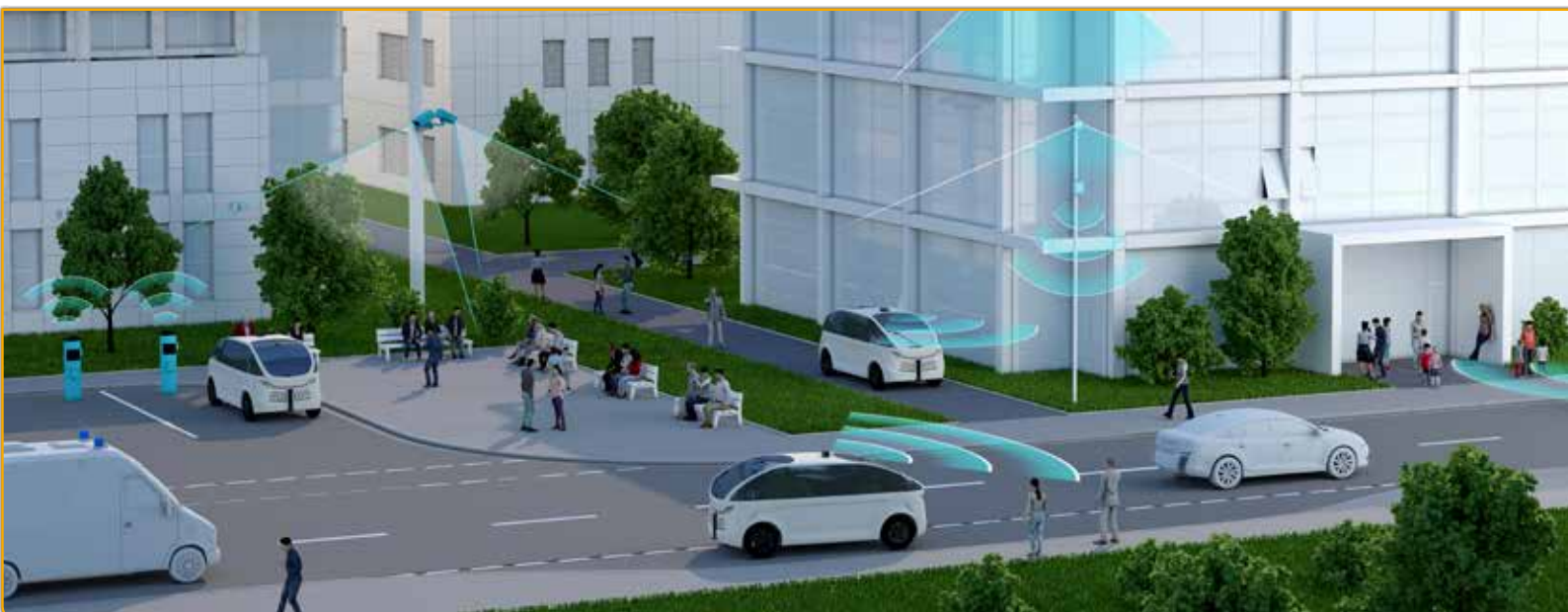
With C-ITS applications, the connecting link for communication between vehicle and infrastructure is the Road Side Unit (RSU). For this purpose, Siemens' Sitraffic ESCoS system uses WLAN-based radio modules, which can be installed on sign gantries, roadworks trailers, light masts and even on roads not yet covered by traffic control systems. Every RSU serves as both transmitter and receiver: It provides passing vehicles with relevant real-time information, e.g. speed limits or black-ice and congestion warnings, and receives traffic-related information on congestion, speed limits or diversion routes from traffic controllers and control centers. It also collects data on local conditions (e.g. temperature, humidity, ambient light) from environmental detectors. In parallel it registers vehicle data, for example speed and type, and autonomously counts the number of vehicles per hour, functioning as a full-fledged traffic detector – an ideal multi-purpose solution.

Actually, C-ITS applications are no longer visionary scenarios, but have been implemented in various commercial and pilot projects in Europe. The best known pilot project is doubtlessly the C-ITS corridor Rotterdam-Frankfurt-Vienna, delivering improved safety and more precise traffic data across national borders. The Netherlands, Germany and Austria are working on a “Cooperative Corridor” between Rotterdam and Vienna. Step by step, all motorway sections along this corridor are being equipped with a cooperative infrastructure based on RSUs and Central Management Systems (CMS). The

aim: providing motorists with early warnings regarding roadworks, and transmitting situational data recorded by the vehicles to the RSUs and then to the traffic control centers. On the motorway sections, which are among the busiest in Europe, backlogs are frequent, leading to substantially higher fuel consumption and pollutant emissions. This means that every backlog prevented will have a correspondingly high positive impact. The eSafety Forum initiated by the European Commission expects a reduction potential of up to 15 percent and an energy efficiency increase of 20 percent.

Projects of this kind are in progress not only on highways, but also in urban areas such as the German city of Wolfsburg, where VW and Siemens have recently started a project aimed at making intersections safer. The test section is implemented on an arterial road in Wolfsburg and comprises ten traffic signal system test section. It uses the V2x technology ITS-G5 (IEEE 802.11p) for the local exchange of information between vehicles and infrastructure, in this case to broadcast the traffic light phases across the surrounding street network.

But this is by no way the endpoint of the development, which is bound to progress from technology-supported driving (driver-assistance systems) to networked driving (Vehicle2x) and autonomous driving (self-driving cars) right up to piloted driving. And ultimately to the data-based integration of all transport systems: Airplanes, trains, trams, buses, ships, parking lots – all will generate data for use in a wide range of applications that will help make mobility safer, easier and less stressful for everybody.



Reduce CO₂ emissions on transport by new services provided by digitalisation



Henna VIRKKUNEN

MEP (EPP Group), Member of the ITRE Committee

Mobility sector is vital for the EU's economy and society in many ways. Mobility is a necessity, people and goods move more than ever and this trend will continue in the future. It is estimated that passenger transport will grow by more than 40 per cent by 2050 compared to 2010 whereas freight transport is expected to grow even more, by 60 per cent. Digitalisation plays an important role in this.

Simultaneously, the EU has committed to meet ambitious climate targets. Transport sector is amongst the biggest emitters as the sector accounts for 25% of all CO₂ emissions in Europe. 94 % of transport still relies on oil products. Air pollution causes 20 % more deaths worldwide compared to 1990. It is clear that we need significant reductions of emissions, not mobility.

There is a pressing need to make transport cleaner, sustainable, safer, multimodal, inclusive and more efficient. Gladly the future of transport offers many possibilities to reduce emissions and congestion as well as increase safety in the sector.

The EU has been advocating for emission reductions by promoting the electrification of transport and use of low-emission vehicles, scaling up the use of renewable fuels and electricity for transport, setting CO₂ emission standards for cars and heavy-duty vehicles, as

well as advancing and paving the way for digitalisation and automatisisation.

It is important to concentrate on combining the most effective measures available in order to meet the targets and create the best possible environment for seamless and effective mobility. Digitalisation and automation offer great opportunities for the sector to tackle the challenges as well as boost the competitiveness of European industry.

In the short and medium term, it is clear that EU will still have to rely on conventional vehicles, while cleaner technologies develop. New services provided by digitalisation, automatisisation and better traffic management enable existing transport capacity to be utilised more efficiently and more environmentally friendly way. For example concepts such as Mobility as a Service, car-sharing services, platooning, electronic documentation in freight transport and digital tachographs are fundamentally changing the possibilities of passenger and freight transport to become ever more efficient.

There are still a lot to be done in order to facilitate these services and technologies. We need integrated infrastructure planning, better charging infrastructure, 5G and Galileo services to facilitate communication between both the vehicles and vehicles and infrastructure.

With joint action at the EU, Member State, regional and local level in collaboration with industry and stakeholders Europe can be a global leader in future mobility. The systematic construction of an intelligent transport system requires long-term partnerships between the European and national bodies and research institutions. Cooperation is the key.

New mobility services also create possibilities to cleaner, safer, and efficient transport for all. To drive innovative mobility solutions and competitiveness even further and to create platforms for cooperation between stakeholders, further investments in research and innovation are necessary.

Transport sector has been greatly influenced by online platforms and digital economy as in recent years, many new mobility services have emerged in a form of online platform. Online platforms are strong drivers of innovation and play an important role in Europe's digital society and economy. They increase

consumer choice, improve efficiency and competitiveness of industry and can enhance civil participation in society. More than a million enterprises in EU trade through online platforms. Here also a level playing field, innovation-friendly environment and future-proof digital infrastructure are keys to success.

In order to make digital services and connected transport possible a proper infrastructure is required. We need to find solutions for the delivery of the appropriate digital and physical infrastructures needed.

In addition to infrastructure, fast connections are also vital for the deployment of connected and intelligent transport systems. In general, the Commission has estimated that 500 billion euros investments are needed to reach our connectivity objectives in the EU. In addition, transport sector needs to adopt artificial intelligence to remain competitive.

Furthermore, there are many questions to be solved regarding the access and ownership of data. Open data is a key to make digitalised mobility services function seamlessly. Cyber-security is also an essential challenge to be tackled as the transport system becomes more digitised and connected. The EU can, and in my opinion should, set global standards for big data, artificial intelligence and automation.

We have to make sure that regulation and financing is innovation-friendly. It is important not only to encourage innovation but also give long-term perspective and legal certainty to entrepreneurs and investors. Europe needs to be a place where new ideas can be created and innovations can flourish. We have to ensure that Europe will be the leader of connected and automated driving in the future.

The future of autonomous transportation will be shared mobility



Thierry MALLET

Chairman & CEO, Transdev Group

With the world population set to reach 10 billion inhabitants in 2050, of which close to 7 billion in urban areas, the question of reducing the number of individual cars is no longer an option. Added to this, 80% of urban population is already exposed daily to excessive levels of air pollution and that the transportation sector generates 27% of total greenhouse gas emissions, the need to quickly achieve an effective and smooth energy transition towards hybrid, battery-electric and hydrogen-electric powertrains is unquestionable. This reality opens a broad path for future mobility solutions that will need to be personalized, autonomous, connected and electric & eco-friendly.

However, autonomous vehicles will only make sense if they are part of a shared and inclusive mobility approach. Turning autonomous vehicles into individual means of transportation would only increase congestion in already saturated urban centers. Our world does not only need cleaner cars, it needs fewer cars.

Autonomous mobility services can provide flexible solutions that are easy to incorporate into existing transportation systems. These solutions can expand the scope of public transportation to better serve places like airports, universities,

business complexes and new towns and cities. They are adapted to first-mile and last-mile travel, either on demand or for fixed routes. The goal is to get passengers to their destination swiftly and seamlessly. Transdev believes that autonomous mobility solutions are a key element of the future of transportation and that shared autonomous mobility services will be a reality on the roads before driverless cars for individuals. Our company is already operating autonomous vehicles on closed sites and is conducting an array of projects on open roads.

Transdev aims to lead the way in mobility services based on fleets of shared autonomous vehicles while ensuring the highest standards for safety, quality of service and customer experience. Autonomous services already meet a wide range of needs: facilitating mobility within city centers and tourist attractions, serving a private or restricted site, taking care of travel to the nearest station or stop and providing a night time or off-peak service.

For that, Transdev has built its strategy on two linked pillars: on the one hand, the company has been providing transportation services in simple use cases since 2005 with autonomous vehicles made by several manufacturers, such as 2GetThere, EasyMile, Lohr and Navya. On the other hand, it has been developing proprietary solutions ("Transportation Technology by Transdev") in order to be able to offer autonomous mobility solutions which are safe and reliable in a broader set of conditions thanks to a state of the art supervision system (inside the Operating Control Center), embedded intelligence

(inside the Autonomous Vehicles), connected infrastructure and a client application. Transdev's mission is to ensure passenger safety, the quality of service and provide the best customer experience. Transdev's expertise in shared autonomous transportation stems from experience in carrying 3.5 million passengers covering more than 1.5 million km since 2005, through initiatives and experiments in Australia, Canada, France, the Netherlands and the United States. By 2020, Transdev's objective is to provide commercial transportation services through fleets of shared autonomous vehicles that are a seamless part of conventional transportation systems.

In Rouen (France), Transdev – with its partners¹ – is pioneering the Rouen Normandy Autonomous Lab experimentation, the first on-demand shared mobility service to use autonomous vehicles on open roads in Europe. The service will soon be open to the public with four autonomous Renault ZOE all-electric vehicles and will be joined in 2019 by the i-Cristal autonomous and electric urban shuttle jointly developed by Transdev and Lohr.

The common success of such new transportation models depends on the commitment of all mobility stakeholders, who are called upon to collaborate in the development of their regions. Sustainable mobility will be co-constructed and based on fruitful cooperation between all players, start-ups, transit operators, industrial players, SMEs and, above all, communities.

Making individual car ownership unnecessary through a comprehensive and affordable transportation offer is undoubtedly an ambitious goal. Nevertheless, it remains the key to the advent of sustainable mobility. It is time to commit to a more sustainable and collaborative world... as opposed to the private car, which is more polluting and individualistic!



¹ Métropole Rouen Normandie, Région Normandie, Caisse des Dépôts Group, Renault Group and Matmut Group.

Electric revolution: imminent or illusion?



Greg ARCHER

Director, Clean Vehicles, Transport & Environment

Cars burning fossil fuels are profoundly unsustainable producing around 12% of the EU's CO₂ emissions. They are also the dominant source of urban air pollution contributing to the deaths of almost half a million citizens annually. Cars with engines are also grossly inefficient typically using just 1-2% of the energy in the fuel to move the occupants. This cannot go - but is the solution, an electric car revolution, imminent or an illusion?

Today, electric cars are a fast growing niche. Sales of cars that plug-in grew 42% year on year in the first half of 2018 and now represent 2.2% of all new car sales with an even share between battery electric and plug-in hybrid versions. But EU sales are dwarfed by neighbouring Norway where 45% of new cars are electric following the Government introduction of significant tax breaks and other incentives.

At present, the electric market in Europe is constrained by a lack of choice with just 30 models theoretically on sale, most with extremely limited availability. Car companies spend just 2.9% of marketing on promoting plug-in cars that are rarely displayed in showrooms with few incentives for dealers to sell.

But driven by car CO₂ regulations the market is about to take off! On average carmakers need to sell cars averaging 95gCO₂/km by 2020/1

and with emissions in 2017 at 119gCO₂/km there is a gap to close. To avoid penalties car-makers will need to sell around 5% cars that plug-in and to do this there will be a surge in new electric models with over 100 on sale by 2021. After a ferocious battle throughout 2019, new regulatory targets have also been agreed that are expected to push the sales of electric vehicles to around 15% in 2025 and over 30% by 2030.

Setting targets is one thing, but will customers want to buy? Norway shows if the price and incentives are right customer demand will follow. The new Tesla Model S is the fastest production car in the world and speed (or torque) sells cars. The quiet and vibration free ride is also appealing to drivers and passengers. A survey of customer attitudes to electric buses in Copenhagen found riders increasingly letting diesel buses go past and waiting for the electric models.

A recent consumer survey found on average 7% of citizens across 9 EU countries said it is "very likely" that the next car they will buy will be an electric or fuel cell. A more significant third said it is "somewhat likely." Most carmakers are confidently forecasting 20-25% sales of electric cars by 2025.

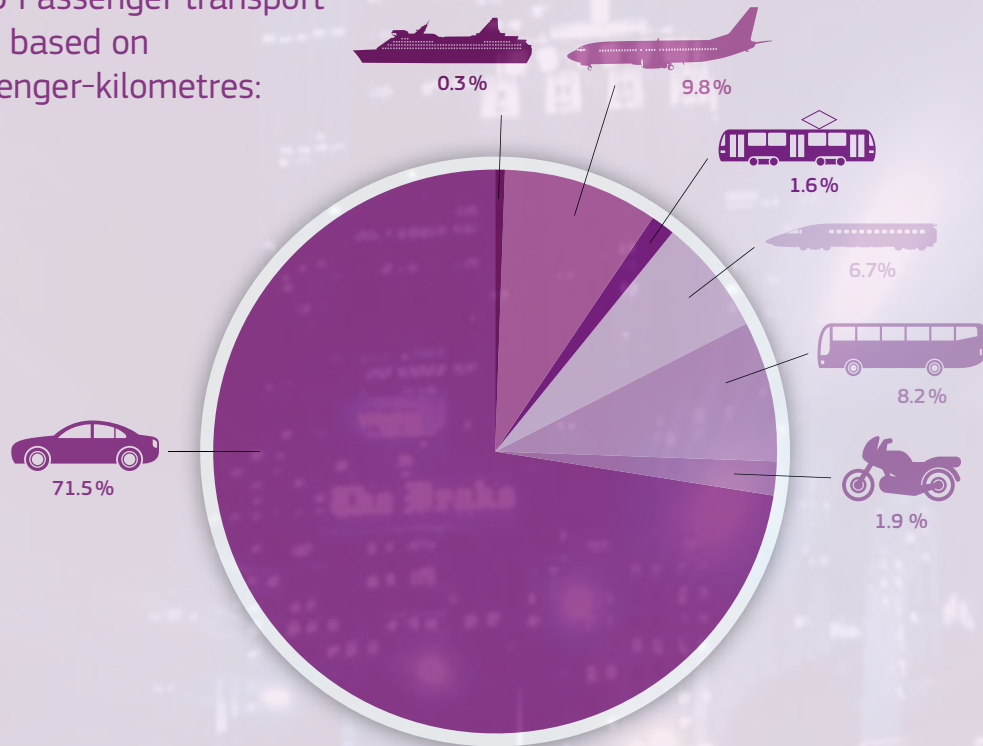
The citizen survey found the biggest barrier to the take up of electric cars is their high price, which was identified by two-thirds of those polled. The battery represents about half of the cost of an electric car, but between 2008 and the early 2020's the price and performance of lithium-ion cells is anticipated to improve by nearly a hundred times. For example a Nissan Leaf battery pack that cost 15 thousand euros in 2015 would half in price by 2020 and cost just 5 thousand euros by 2025 - this is game changing.

With cheaper batteries longer range cars become affordable. New mainstream battery electric models have already increased in range up to around 250 km; in the premium sector 500 km will become increasingly commonplace. Recharging will typically be needed a few times a week, not daily. The availability of recharging points remains a concern for customers but ultra-fast charging stations are being deployed along highways to make it possible to use electric cars on longer trips

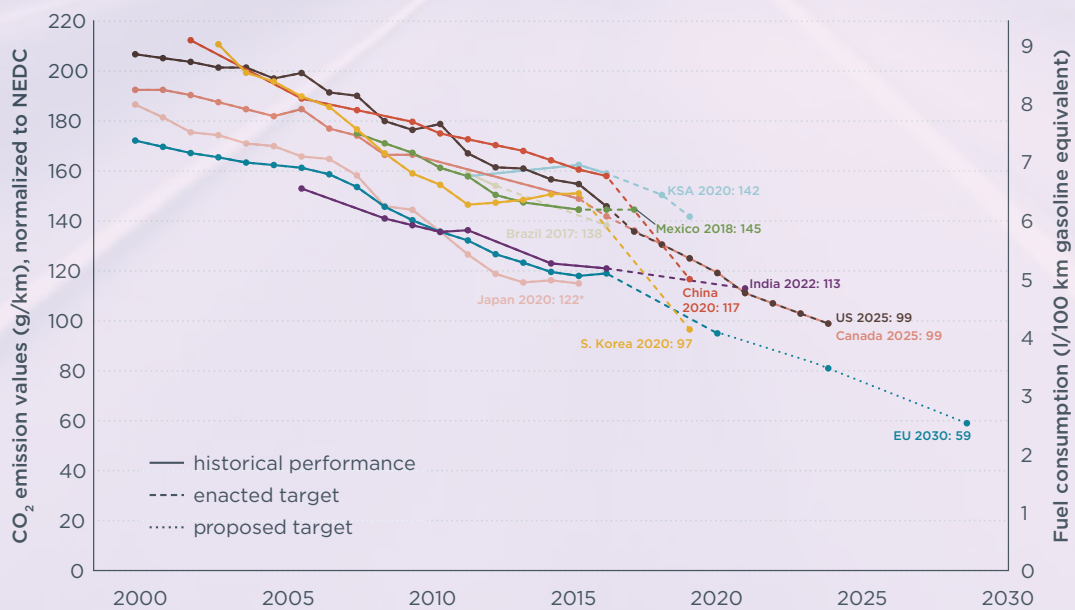
in the time it takes to buy and drink a latte. Along primary routes there is already a fast charger every 34 kms and there will be around 220 thousand public charging points EU-wide by 2020 - around one for every 10 electric cars. In western Europe and Scandinavia the chicken and egg problem is solved, business will now deploy further points as the number of cars on the road grows.

The European Commission forecast that to meet Paris climate commitments by 2050 80% of cars will be battery electric models and most of the remainder hydrogen fuel cell. Such a shift in the market will increase demand for electricity by about 20% which must be produced renewably. But with solar and wind prices dropping this remains a cost effective and viable solution to our climate crisis. In contrast a fleet of cars powered with e-fuels would require 10 times more new renewable power. To meet climate goals the last new car with an engine needs to be sold by the early 2030's. Europe is lagging behind where it needs to be but heading in the right direction. The shift to electric cars is imminent.

2015 Passenger transport
in %, based on
passenger-kilometres:



Source: EU Transport in Figures 2017 / DG MOVE estimates on EU Transport in Figures 2017 data



Comparison of global CO₂ regulations for new passenger cars.


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BIOREFINERIES: A NEW DEAL FOR ENERGY.

Eni's Milan headquarter was created in 1952. It was conceived as an urban reconversion project: a site transformation aimed at promoting growth both for the city and business enterprises. Transforming sites and giving them a new life is part of Eni's present. This is what we are doing both in Venice and Gela, where we are reconverting plants into biorefineries producing new fuels from renewable sources: a new generation of ecofriendly biofuels. To better understand the background that led to the requalification of these plants, we have to go back to what happened in Japan a few decades ago [...]

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