Tesla Model S participating in the EV Rally in Trollstigen, Norway Source: Norsk Elbilforening





Transport is now the EU's largest source of  $CO_2$  emission. The primary issue is road transport that causes almost  $\frac{3}{4}$  of total transport emissions. Tackling this issue will require a transformation from the internal combustion engine to electric powertrain along with the progressive decarbonisation of electricity production.

Electric vehicles (EVs) are at the heart of developing synergies between the transport and energy sectors. EV integration into the electricity grid offers a particularly compelling solution for energy storage and grid services, enabled by so-called vehicle-to-grid mechanisms and smart charging. EVs therefore have a role to play both in the energy and transport transitions, and provide a market-ready solution to put the EU on track to meet the targets of the Paris 2015 agreement. While the automotive industry is starting to invest more seriously in electric powertrains, consumer uptake in the EU is also progressing quickly now.

As a nascent market, electric vehicles need the right policy framework to thrive. Looking at EV policy developments in California and in China, the introduction of a scheme equivalent to a zero emission vehicle mandate for car manufacturers is an efficient mechanism to steer the market. This will also provide the required certainties to develop a comprehensive electric vehicle ecosystem, particularly in term of infrastructure requirements.

The shift to electric vehicles will also bring about additional employment and environmental benefits for the EU. As far as competitiveness and jobs are concerned, the early start of an EV production in Europe will be key to maintain its worldwide leading status in car manufacturing. In parallel, European cities will become cleaner with incremental EV uptake mainly due to the reduction in noise and less pollutant emissions.

#### **DID YOU KNOW?**

Since 2014, global electric vehicle (EV) sales have more than doubled, while worldwide EV sales jumped by 42% in 2016 compared to 2015. Today, more than 2 million electric vehicles are driving on the world's roads.





- **1** Electric vehicle market growth in Europe is projected to go from 630,000 vehicles in circulation to **900,000** in 2017.
- **2.** European countries leading in sales of EVs include Norway, Austria, France and the Netherlands.
- **3.** Electric vehicles produce no tailpipe emissions, meaning no CO<sub>2</sub>, nor fine particles or NOx, thus improving air quality and health in cities.

- **6**. The transition to electric vehicles could generate between 501,000 and **1.1 million** net additional jobs by 2030.
- 7. In 2017, there are around **110,000** publicly accessible charging points in the EU, including Norway and the UK.
- 8. New EV models like the 2017 Chevrolet Bolt, the Opel E-Ampera and upgraded Renault ZOE and Nissan Leaf have a real world driving range of **300-350 km**.

With its 100,000 electric vehicles, that account for only 3% of the total passenger car fleet, Norway saves approximately 200,000 tons of CO<sub>2</sub> emissions annually.

- Carbon-free gross electricity generation in Europe went up from 46% (2000) to 52% (2012) and should reach 58% (2020), 66% (2030) and 73% (2050).
- EV carbon emissions from 'well-to-wheels' are estimated at only 78g CO<sub>2</sub> equivalent compared to 185g for conventional gasoline and 145g for diesel engines.
- 9. Leading EV sales in Europe in 2016 included Renault Zoe (21,619 cars), Nissan Leaf (18,876) and BMW i3 (15,091).
- **10.** Major EV investments: Daimler announced €10 billion by 2025 and Volkswagen aims to electrify **25%** of its fleet by 2025.

Sources: EAFO, EVvolumes, ACEA, Aria, European Commission, DG MOVE, ECF, T&E, Electrive.net



Stimulate EV market uptake with a European Zero Emission Vehicle (ZEV) mandate and ambitious CO<sub>2</sub> targets. A ZEV mandate of 15-20% by 2025 and 30-35% in 2030 would ensure a progressive transition to an alternative powertrain. Parallel to that, European regulation should set a CO<sub>2</sub> fleet average at 80g WLTP (Worldwide harmonized Light vehicles Test Procedures) in 2025 and 60g WLTP in 2030, which equals a reduction of 6-8% per year between 2020 and 2030.

#### 2. Tackle kilometer range anxiety of drivers by adapting infrastructure roll-out.

Adapted charging infrastructure is a prerequisite for consumer uptake of electric vehicles. This means that in urban areas the emphasis should be put on normal charging (<22 kW), which is more appropriate to city use of EVs. By contrast, fast charging infrastructure (>50 kW) should be deployed primarily along motorways, where EV users need to charge more rapidly than in cities.

#### 3. Integrate EVs in the electricity grid with smart charging and demand response services.

Allowing demand response mechanisms and storage activities, in which electric vehicles have a key role to play, will enable the smooth integration of EVs in the electricity grid. This is of particular importance given the current trend of increasing electricity demand and growing share of renewables in the electricity mix.

#### **4.** All new buildings should be equipped with electric charging points.

To stimulate EV use, the installation of charging points in residential and commercial buildings should be promoted. Such requirements would contribute to put in place the necessary infrastructure in buildings, making them ready for the deployment of electric vehicles.

#### 5. Electric vehicle users should be granted in-kind benefits

Cities should put in place incentives for EV use in urban centers by allocating dedicated parking places with free charging points. In addition, EVs should be allowed to use bus lanes, as is already the case in Oslo. Furthermore, cities should introduce exponential zones of low or zero carbon emissions to encourage the use of electric vehicles.







# **Greg Archer** Director of Clean Vehicles at Transport & Environment

## What innovations can we expect from electric vehicles between now and 2050?

In the coming years, we can expect electric vehicles to become much cheaper, to improve significantly their range, and to charge more quickly in 15 minutes. For at least the next 10 years, progress will be made through mass production and incremental improvements in current lithium-ion battery chemistry. We expect to see battery pack prices at €150/KWh by the early 2020's by which time it will be cheaper to lease an EV with a range of over 500km than a conventional car; and the utility of the EV will be almost as good. Within a decade, advanced solid state batteries or lithium-sulfur/air technologies could be market-ready and lead to a further step change in battery performance and cost leading to the final replacement of the internal combustion engine for almost all applications.

# How do electric vehicles contribute to the energy transition?

Electric vehicles can provide flexible demand and storage mechanisms to the electricity grid, through demand response services. They will be progressively used for grid balancing and integrated into homes as these also become partially off-grid. In this context, electric vehicles will act as a key enabler in the transition from electricity consumers to prosumers.

#### Is Europe leading or following on electro-mobility? What should be done to ensure EU leadership?

The EU remains a global leader for electromobility. The EU is the second biggest market for EVs globally, and is likely to retain this position. Nissan-Renault is the biggest manufacturer of electric vehicles in the world. This leader status could be maintained by the introduction of a Zero Emission Vehicle Sales Target of 15-20% by 2025 and above 35% by 2030. If supported by reform of car taxation these changes would make electric vehicles more attractive for company

fleets, compared to conventionally fueled equivalents. In the case of Germany for instance, electric vehicles are taxed more heavily than diesel cars. This needs to change.

## What do you think is the key to engage end users in the energy transition?

There are four key needs that would lead to more profound user engagement in the energy transition: 1) the price of electric vehicles has to drop to make

# What other major technological developments will accompany electric vehicles deployment?

The transition to electric vehicles will occur simultaneously with the raise of connected and driverless technologies. This will create many beneficial synergies, but will also entail some risks. That is why cities will need to make sure that we do not only address air pollution and climate problems. We should also avoid that our cities remain car dominated. To ensure this transition, a shift is needed from privately owned to shared mobility models,

# We can expect electric vehicles to become much cheaper, to improve significantly their range and to charge faster.

electric cars more affordable. 2) the performance of EVs has to increase so that their utility becomes comparable to conventionally fueled cars. 3) the use of charging infrastructure should make recharging an electric car as easy as refueling a petrol car. And 4) the car industry needs to provide the market with much more choice and apply its outstanding sales and marketing skills to showcase electric vehicles as an attractive and modern alternative to the internal combustion engine. If that happens, alongside in-use incentives in cities, then the transition to electric vehicles will happen very rapidly. in parallel to the growth of the electric vehicle fleet. This way, cities will be able to allocate more road space to bikes and buses, in order to create a system of connected electric co-modality in urban areas.





### **ELECTRIC AND SHARED MOBILITY** France

Electric and shared mobility is an integrated part to the Lyon smart city project in France. Bluely, the car sharing scheme launched in 2013, now comprises over 300 vehicles, and totals more than 7,000 subscribers. The Bluely charging network is composed of 500 charging points in more than 100 charging stations across the city of Lyon and its suburbs. With a rate of €4 per 30 minutes and a subscription fee of €1 per month for users under 25, the offer provided by the Bolloré Group is particularly attractive to young people. In 2017, the company aims at reaching 175,000 hires compared to 100,000 in 2016.

## SECOND-LIFE FOR EV BATTERIES Germany

BMW has developed an initiative together with Vattenfall and Bosch to give used car battery packs a second-life. The use of second-life EV batteries is currently tested in a 2 megawatt (MW) energy storage system in Hamburg to keep the electricity grid stable. The electricity storage facility comprises 2,600 battery modules from more than 100 electric vehicles. Work on battery second-life development led BMW and Vattenfall to sign a partnership for the use of batteries in the Princess Alexia wind farm (Netherlands), providing a storage capacity of up to 3.2 MW.





## **ELECTRIC CITY LOGISTICS** Germany

Deutsche Post DHL (DPDHL) developed its own electric van dedicated to the last mile delivery, after buying in 2014 a startup called StreetScooter.

Production started end of 2016, with the first 2,000 units. StreetScooters have an in-service range of 50 to 80 km between recharges, and can carry up to 650 kg of load at a time. The initial plan was to produce around 5,000 units a year.

In the future, the company will not limit the production of the Streetscooter to its own usage. It is already looking for a second production site in order to double its annual production, and intends to sell half of it to third-party customers, mainly local governments and large fleet customers. The StreetScooters' market price is expected to be around €32,000.

DPDHL's decision is both beneficial for the environment and for the company's budget. Indeed, electric vehicles' total cost of ownership (TCO) is more advantageous than TCO of conventionally fueled vehicles.

(Left) Station Bluely, Lyon, France. Source: Benoît Prieur (Middle) Energy storage facility, Hambourg, Germany. Source: Electrek (Right) DHL steetscooter at work, Utrecht, Netherlands. Source: harry nl



