Europe needs electro-mobility to decarbonise transport

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Electro-mobility offers an unequalled solution to make Europe's transport more efficient and less emission-intensive and polluted. The electrification of transport, coupled with the low-carbon production of electricity and hydrogen and implemented in conjunction with broader sustainable transport principles,[1] is needed to realise the Energy Union's aim to "decarbonise … road … and rail transport" (Energy Union package 2015)[2], in addition to improving noise levels and air quality in urban areas where this is an acute problem. It therefore must be a cornerstone of Europe's decarbonisation of transport strategy to be announced early 2016.

In this paper, the Platform for electro-mobility presents what needs to be done to move Europe closer to a sustainable, multimodal transport system in which people and goods are predominantly moved across land using sustainable electricity. The Platform for electro-mobility is an alliance of organisations from across industries and transport modes representing producers, infrastructure managers, operators and users as well as cities and civil society, who have joined forces to drive forward the electrification of surface transport.

The electrification of light vehicles such as bicycles and powered two-wheelers, cars, vans, trucks and buses, as well as the further electrification of railways, will help Member States to meet greenhouse gas emission reduction and air quality targets for 2030 and beyond. Electric transport, be it individual or public, is a true low carbon alternative to reduce local air pollution in cities. Electro-mobility will play a vital role in halving emissions in urban centres by 2050 and attaining zero-emission urban logistics by 2030.[3] Furthermore, electrification is essential to achieve the Transport White Paper's objective of banning conventionally-fuelled cars from cities by 2050.

To realise the full potential and numerous benefits of electro-mobility in the European internal market, and to overcome existing barriers for its uptake, the Platform has identified recommendations on policies that will turn Europe into the "leader in e-mobility" (Energy Union package 2015):

[1] Paris Declaration on Electro-Mobility and Climate Change, http://newsroom.unfccc.int/lpaa/transport/the-paris-declaration-on-electro-mobility-and-climate-change-and-call-to-action/
[2] European Commission 2015, Energy Union package, COM(2015) 80 final, p.24 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2015%3A80%3AFIN
[3] European White Paper for Transport 2011, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN

The Platform recommends the following policy areas and measures:

- **Help cities to purchase electric vehicles**, set up interoperable infrastructure and better cross-modal information to encourage electric vehicle-sharing solutions and foster intermodality, i.e. the combined use of different modes of (electric) transport in urban areas. A legal clarification is needed of how Public Transport Operators and Authorities can sell electricity. Electro-mobility needs to be better integrated into Sustainable Urban Mobility Planning and related public support should be earmarked.

- To **enable the European rail sector to contribute further to electro-mobility deployment**, a dense rail network in Europe needs to be maintained. The European Green Public Procurement Directives[4] should allow based on environmental footprint and life-cycle-costs, and public transport operators should be allowed to reuse recovered energy (from braking) in the most efficient way, for example resell it to the grid.

- Smart charging of electric vehicles can greatly benefit EV owners in reducing their electricity (charging) costs as well as their total costs of ownership, as well as adding stability and reliability to the electricity system. Regulatory regimes should **incentivize market parties to invest in and use smart charging**, and clear roles and actor definitions are needed to ensure interoperability. Member States should be encouraged to incorporate smart charging measures into their national infrastructure plans, mandated by the Alternative Fuels Infrastructure Directive[5], as well as in their urban mobility policies.

- Standardisation solutions for an internal market of electro-mobility and its services require the establishment of **smart metering**, i.e. stationary or on-board metering, improving collaboration between grid operators and end-users, strengthening system reliability and providing new business opportunities. An **interoperable electro-mobility service market in Europe** requires a **roaming** system that can be established between charging point operators, but should also allow electricity roaming, i.e. allowing customers to choose a (renewable) energy supplier.

- Set **incentives for the support of light electric vehicles, electric cars and vans** through extending the Clean Vehicles Directive[6] and utility vehicles where appropriate such as road maintenance, waste disposal and social services transport vehicles as well as setting more ambitious criteria on purchase; encouraging Member States to grant EV use incentives such as Co2 taxation at registration, VAT exemptions, fuel taxation, access restrictions to Low Emission Zones or parking benefits. The European Market for light electric vehicles will benefit from a simplified Type Approval Regulation and better harmonised safety rules as well as reduced VAT and adapted infrastructure solutions.

[4] Directives 2014/24/EU and 2014/25/EU
[5] Directive 2014/94/EC
[6] Directive 2009/33/EC

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2. Benefits: How electro-mobility helps decarbonising transport – clean, sustainable and easy

Electric surface transport can **reduce CO_2 emissions and air pollution as well as congestion**, notably **in cities**[7]**,** provided that the e-buses, e-car sharing options and shared LEVs are **integrated** in multimodal public transport systems offering more choice for customers and more comfortable, seamless and energy-efficient travel. Electric vehicles emit no local air pollutants such as NOx and particulate matter. This removes key air pollutants from cities, improving air quality. Interoperable charging infrastructure as well the possibility to sell charging services and energy at public charging points depending on the market model in the respective country would incentivise Public Transport Authorities and Public Transport Operators to invest in electro-mobility.[8] To realize these benefits, further Research, Development and Innovation activities and projects seeking synergies between various electric modes of transport in cities are needed.

The electrification of Europe's vehicle fleet offers a significant opportunity to **decarbonise road transport,**–which currently accounts for a third of Europe's greenhouse gas emissions and a third of its energy import bill, and is needed to achieve necessary CO_2 reductions in the transport sector by 2030 and 2050. With low running costs, electric vehicle drivers save on their fuel bills and can amortise the purchase price quickly, especially on **electric vehicles in fleet applications**. More than 80% of EU vehicles drive less than 65 km per day[9] and can be fully satisfied by the range of full battery electric vehicles. The growing **Light Electric Vehicles (LEVs)** segment comprising e-bikes and other powered two-wheelers can offer a sustainable mobility alternative to short trips as half of all car trips in the EU are less than 5 km, inciting more health-preserving physical exercise while contributing to better air quality.

Electro-mobility helps the European Union to provide **energy security by reducing Europe's reliance on fossil fuels and boost renewables use and storage.** EV batteries in cars and reused battery packs can be used as flexible energy storage to support variable renewable power. The electricity system is robust enough to cope with a fully electrified fleet, without having to further invest in generation and transmission assets when these cars charge outside the peak hours. The solution, **smart charging,** allows for an intelligent charging of electric vehicles during times of lower electricity demand and prices and without having a significant impact on the customer. Smart charging reduces the total cost of ownership of a vehicle, leads to significant CO_2 savings and empowers consumers to benefit from the energy stored in their batteries. As EV sales increase, more battery **storage capacity** could be delivered, providing a solution for lacking storage options for renewables energies in the future.

Cars are normally parked for more than 90% of their lifetime[10]. Thus, electric cars can provide flexibility services to the electricity system by offering "valley filling" (shifting consumption to a different point in time), "peak shaving" (sending power back to the grid when demand is high) and ancillary services (voltage control, frequency regulation). Two major uses are explained in this paper. First, the 'smart' charging of EVs in periods of lower electricity demand, thereby flattening the load curve and reducing

[7] In 18 EU countries, European cities face infringement procedures because they exceed European air pollution norms

[8] Payments at the charging stations vary and the typical electro-mobility service sold to customers is based either on the time used (flat rate tariff) or on the kWh consumed.

[9] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/individual-mobility-conventional-electric-cars

[10] http://www.reinventingparking.org/2013/02/cars-are-parked-95-of-time-lets-check.html

peak demand (grid-to-vehicle, or G2V or load management). This can prevent underground cables, transformers or substations from being potentially overloaded, thus avoiding a need for major grid reinforcements. At the same time, EVs can also help **balancing the grid** by facilitating the local integration of renewable energy sources into Europe's electricity grids. Second, in the longer term, smart charging can enable EVs to act as virtual power plants feeding electricity back into the grid in a vehicle-to-grid scenario (V2G). To enable vehicles to handle excess generation in particular from renewables, a number of technical and regulatory barriers need to be overcome, including battery lifetime, electricity metering issues and its economic value.

Sustainable and standardised charging payment, access options and services across Europe are needed for electric vehicles market to take up. There are different models for payment and access to the charging stations: either via electricity roaming (long-term contract) or pay-as-you go solutions (direct payment). Both electricity roaming and direct payment provides cost transparency for consumers and completes Europe's energy market competition. Similarly, there are different ways of measuring electricity consumption and displaying the information to the customers. Options include, amongst others, metering at the electricity supply point, mobile metering or on-board metering. These options need to be further considered and their use depends on many different factors: public charging infrastructure, regulation and metering in the different countries. They should be based on careful cost-benefit analysis and market developments, in line with customers' needs.

Rail-bound solutions for mainlines, urban and suburban transport are already a major provider of electric mobility. In the EU, rail transport is responsible for 0,6% of the transport sector's greenhouse gas emissions while ensuring an 8,5% modal share of main line transport. Today, already 50% of lines are electrified and 80% of traffic is running on these lines in the EU. The further electrification of rail may therefore reduce the CO2 emissions of rail potentially to zero thanks to the development of renewable energy sources in Europe and improve Europe's energy security. European railways have committed to reduce their energy consumption from train operation by 30% by 2030 and 50% by 2050 compared to 1990 and strive towards carbon-free operation by 2050. In parallel, the European railway supply industry has earmarked energy efficiency as one of the key topics to be addressed by the SHIFT2RAIL Joint Undertaking. Investments in infrastructure and rolling stock will make railways more competitive and improve their energy efficiency (energy recovery, storage & re-use). Furthermore purchasing decisions of railways on electricity encourage cleaner forms of energy production i.e. renewables in electricity generation.

3. Barriers to electro-mobility uptake Europe needs to tackle

Barriers to electro-mobility uptake are technological, regulatory and economic.

1. Electro-mobility and intermodality in cities

Technological Barriers:
One of the challenges to electro-mobility uptake is that electric buses do not yet offer the same flexibility as diesel buses. For public transport operators it is of paramount importance to guarantee operation at the same standard and reliability for all used technologies. The integration of electric buses into the fleet requires a number of operational and technological adjustments, for instance the provision of an interoperable charging infrastructure and the improvement of autonomy and range of electric vehicles

Regulatory Barriers:
The provision of charging infrastructure is a costly investment for the Public Transport Authorities and Public Transport Operators. An incentive for electro-mobility uptake would be the possibility for the Public Transport Authorities and Public Transport Operators to be able to recover parts of the initial investment by selling energy (which can be recovered energy from public transport systems) at charging points also to private customers. Unfortunately, there is no legal clarity as to whether the Public Transport Authorities and Public Transport Operators are allowed to sell energy.
Urban nodes interchanges, i.e. links between different parts of the transport network (motorway corridors and cities for example), involving several actors, can lead to over-complex governance and lack of user-friendliness for the end traveler, thereby not being attractive enough for customers to switch to electro-mobility solutions. This is particularly the case for the installation of diverse infrastructure as well as division of parking lots between different modes of transportation. Conflict over space with other public transport operators at the same interchange can arise, and the lack of leadership on the whole interchange adds complexity.

Economic Barriers:
A good alignment of the electric bus demand and the offer of products is not yet in place, and it has to be considered in all its aspects. In order to successfully implement and run a fully electric line, it is essential to make the tendering process evolve from a simple vehicle purchase to the tendering of a comprehensive electric system, taking into account life cycle costs, charging infrastructure, batteries, economic models, leasing and renting, vehicle purchase etc.
Energy efficiency as well as cost efficiency are important factors influencing the decision on the uptake of alternative fuels, such as electricity, for Public Transport Operators and Public Transport Authorities. Currently, the effective purchasing costs of electric vehicles (buses and cars) cannot compete with the costs inherent in the decision for other fuel options. Furthermore, the uptake of electro-mobility requires substantial investment into charging infrastructure, which, in the absence of a common standard, can even increase if different charging standards, let alone different infrastructure managers, prevail in one city. All modes must therefore work to provide more competitive solutions, with faster time to market.
In light of the need of funding for electro-mobility, the current public presentations regarding Connecting Europe Facility and the European Fund for Strategic Investment (EFSI) do not always correspond with the expectations from Public Transport Authorities or the industry. For example, although urban mobility projects in nodes of the trans-European transport network qualify for support from the Connecting Europe Facility, the funding budget is too limited to cover a large number of projects. Regarding EFSI, as a short-term return on investment is considered to be one of the key conditions for a successful application, electro-mobility as such, and more particularly heavy investments such as urban interchanges, are likely to be rejected during the application process.

2. Electric Rail (urban & main line)

Technological Barriers:
Although electric rail is already well established in many countries, there are still a number of technological obstacles to overcome for electric rail to meet its full potential.
Firstly, a major challenge is the lack of public support to rail research and development to improve the rail system's energy efficiency. In spite of its excellent track record, electric rail can still improve its performances and reduce energy consumption, but public funding dedicated to rail research remains insufficient. While the SHIFT2RAIL Joint Undertaking is a major initiative co-funded by the European Commission and rail stakeholders to bridge this gap, these efforts should be maintained and intensified in the future in order to be consistent with the EU's modal shift and climate objectives.
Linked to this barrier lies an engineering challenge to develop new solutions to recover and reuse energy. Among the main innovations of the past few years, permanent magnet motors have had a huge impact on the energy efficiency, as well as regenerative braking, reduction of weight due to the use of lighter materials and composites etc. However, these solutions can be improved to further reduce the environmental footprint of rail products, and they need to be rolled out more widely.
Finally, the railway systems' life-cycle costs must be improved. By increasing recyclability and recoverability of materials, and increasing the lifespan of components, the railway system will become even more sustainable, efficient and attractive for end-users.

Regulatory Barriers:
Due to the recent uptake of energy efficiency technologies, there is still uncertainty and lack of coordination of responsibilities, especially for main lines (braking energy generated by railway undertakings, recovered by infrastructure managers and stored by station owner). An additional difficulty is that railway companies (urban or main line) are not always legally able to reuse energy outside of the railway system and do not have the capacity to sell it to the grid owner. From an industry point of view, the capability to demonstrate new innovations in a real-life environment is another barrier.
Finally, public procurement still often focuses on the solutions requiring less initial investment, not taking into account a life-cycle costs approach during the tendering phase (environmental performance criteria etc.). The revision of the EU public procurement framework in 2014 should contribute to modify this approach and to support the uptake of state-of-the-art energy efficient technologies.

Economic Barriers:
Being the most electrified mode of transport means for rail that it is the only mode indirectly covered by the Emissions Trading System, paying the full carbon price. Furthermore, as a major electricity consumer rail also contributes financially to the development of renewable energy sources in Europe.
Today, already 50% of lines are electrified and 80% of traffic is running on electric network in the EU. While there is still room for improvement, the main economic barrier is the cost of new rail infrastructure, or even the cost to upgrade and electrify the existing infrastructure. This is especially true for parts of Europe in which there is a low density of traffic. In this respect, network electrification cannot reach 100% since the return on investment is too low on low density lines or last mile infrastructure. However, battery powered locomotives may also be an option. Another economic barrier is the slow market uptake of more energy efficient solutions, as more initial investment is requested before significant savings can be made and procurement does not always take sufficiently into account life-cycle costs. Finally, a current barrier for the further development of electric rail is a lack of public investments in intermodality (i.e. by fitting railway stations with electric vehicle charging facilities).

3. Grid integration of electric vehicles

Technological Barriers:

Concerning **grid-to-vehicle technologies,** there are no technical barriers for smart charging or feeding renewable energy into Europe's distributed electricity grids. Their integration depends on whether electric vehicles will be distributed evenly or will be concentrated in specific clusters and what will be the basic mode and power of charging. The energy consumption of EVs in terms of total energy demand is not high (100% EVs will add 802 TWh or 24% to total energy demand) but the increase in peak demand can be much higher if many vehicles charge at the same time – causing potential congestion of local transformers or voltage disruptions. Given that most of the charging is expected to take place overnight at home or during the day at the office, the distribution grid at the local level (mainly low-voltage level) will be first affected in case of high density of EVs, increasing requirements for the network capacity at the local level and thereby for smart charging.

However, due to the general trend towards decentralized generation and a high level of smart applications, EVs have a considerable potential as flexible loads to balancing the grid by facilitating the local integration of renewables (and they will be able to charge more quickly). One interesting use case for electric vehicles is its use as local storage connected to a smart home (Vehicle-to-home), above all if coupled with solar panels or other renewable energy production. An EV parked and coupled with a solar panel installed at customers' premises could sensibly increase the share of self-consumed electricity, allowing for the integration of 'prosumers' into the power system while reducing the peak production exported to the grid. However, the ability of EVs to absorb the overflow of energy produced from the local use of renewables will require a better organised management of EV availability and development (e.g. organisation of commercial offers, aggregation issues).

Vehicle-to-grid allows the use of the electrical storage of a parked BEV or PHEV to feed in electricity to the grid and provide similar or more advanced services as for G2V such as valley filling, peak shaving and buffer storing. Potential technological barriers are the cycling/discharging rates could affect the lifetime of batteries (i.e. battery degradation and losses) installed in electric vehicles, above all for intense participation in V2G services. Therefore the cost/benefit ratio needs to be considered in order to develop realistic applications. Further research projects are needed to test the technical potential of vehicle-to-grid and its impact on battery lifetime.

Regulatory Barriers:

With regard to **grid-to-vehicle technologies,** there is little customer incentive in smart charging because retail prices do not provide a strong price signal to the consumers. On the one side, electricity spot-prices vary only little and, on the other side, network tariffs – and often tax and levies – are fixed.
Moreover, a large number of customers do not have access to real-time pricing, i.e. they cannot (yet) be metered and invoiced on the basis of hourly or where applicable quarter-hourly wholesale market prices. For these reasons, as of today there are very few commercial offers available from retailers or independent service providers. Likewise, there is little incentive for market parties to invest in smart charging solutions.

In many countries today, DSOs are obliged to design their networks to meet peak demand at all times. Yet with more and more distributed energy sources (Renewable Energy Sources and EVs) connected to Europe's distribution grids, other innovative solutions may be more effective.

In addition to having common plugs and connectors, full implementation of relevant communication standards is needed to ensure electric vehicles can be charged and communicate with the electricity grid anywhere in Europe. For example, a bi-directional intelligent communication taking place at the charging station level is needed in order to ensure interoperability and effective exchange of information and data between car systems and energy and electro-mobility market players systems at different time steps. Overall, a clear need for commitment by all vehicle manufacturers to the concept of smart charging and grid friendly behavior is needed.

Vehicle-to-grid technologies, like the battery of an EV or hybrid vehicle feeding electricity into the grid, face the general problem of any storage tool connected to the grid: the absence of a definition of energy storage in the EU legislation, and in particular in the Electricity Directive[11]. This results in unclear connection rules for storage systems in certain member states, discouraging the deployment of storage technologies and creating considerable disparities between national markets.
Besides, storage systems are often considered as generation systems: in countries with grid fees for consumers and generators, this leads to a double grid fee to storage tool owners who want to feed electricity into the grid. Grid tariffs should therefore be addressed to remove these barriers and incentivise the deployment of electric vehicles.
The business model of V2G does not rely only on selling electricity to the grid: batteries can also provide important flexibility and ancillary services to stabilize the grid. Nevertheless, the services offered by V2G are today not properly valued and rewarded by the market. The balancing market is today conceived for traditional energy markets with energy produced only in conventional power generation plants, disadvantaging or excluding small producers and service providers. Proper reward schemes should be developed for retail and wholesale at the EU level to define attributions, roles and duties of prosumers and new actors such as aggregators. All future business models need to address data protection and liability.

Economic Barriers:

Economic barriers may become more important than the technical ones when it comes to using the EV battery for load management or V2G purposes. **For grid-to-vehicle**, today, more 'traditional' options (such as a simple control switch) at the grid level are already available and cheaper to use but in the long-term with a large-scale penetration of EVs, more innovative smart charging management systems will be needed that should nevertheless be assessed from a cost perspective. The combination of smart charging and metering and dynamic electricity pricing at retail has considerable potential for optimizing charging for customers charging at home while contributing in the balance of the electricity system.

V2G is today at a pre-commercial stage and business models have yet to be further developed. But demonstrators show economic potential[12]. But the cost/benefit ratio should take into account the potential degradation of the battery as well as the overall transaction costs attached to it (the costs are likely to outweigh the benefit in offering a capacity of a single car for grid balancing). In addition, to feed in electricity into the grid EVs have to be equipped with an inverter or a bidirectional charger, raising the total participation cost.

[11] Directive 2009/72/EC
[12] In Denmark, V2G could generate up to 1432 Euro per year per car for private users, not counting additional fuel economy. Source: Best case scenario from INSERO forecasts in March 2013, real-world trials in Denmark in 2016.

4. Interoperable charging and payment services

At present, there are a number of unresolved issues in European standardisation that should be addressed with urgency such as electric vehicle integration with smart grid and home management systems, interoperability testing methods and procedures and, standardised data models and communication interfaces. If left unchecked, the end result for electro-mobility is predictable; suppliers have limited confidence that the technology they invest in will function as intended, while end-users face higher costs from market fragmentation as proprietary solutions become the norm.

Technological Barriers

Metering

Even with intensive standardisation efforts and investments, an EU-wide roll out of electric vehicle (EV) infrastructure presents a risk of neither being ready or available for sufficient market penetration within the proposed EU timescales. More specifically, metering faces the following issues:

- All technologies must be compatible and interoperable, but currently key components remain incomplete and untested.
- Stakeholders have divergent investment and innovation cycles, with markets progressing faster than standardisation processes.
- High complexity and cost, with each component needed to be installed at every location where the vehicle will smart charge, increasing risks of infrastructure gaps and malfunction.

Therefore, for electro-mobility to advance as expected, providing end-users with the functionality they require in a cost-competitive manner, all proposed metering solutions should be subject to rigorous cost-benefit analyses, to ensure Europe's electro-mobility infrastructure is suitable for all stakeholder needs.

Regulatory Barriers

Roaming

A well-formed recharging market for electric vehicles should provide consumers with confidence in their chosen services, price transparency, improved access for new entrants and a sustainable economic model for electric vehicles to flourish and create value for electro-mobility services.

Different market models exist and one can differentiate between types of roaming; roaming of electricity and service and, roaming of charging services. Electricity roaming allows EV drivers to benefit from a specific electricity supply wherever they charge. This model gives to any consumer the ability to choose a single electricity supplier, which establishes specific measures defined by contract for each charge. Similarly to what is done in the mobile phone industry, EV users are allowed to get the same quality of service anywhere they charge in a seamless way. In the 'roaming of electricity and service' model, the consumed electricity is purchased from an electricity retailer chosen by the electro-mobility service provider (here, the electricity customer does not choose any electricity supplier as such directly, as the electricity supplier will be associated to the electro-mobility Service Provider chosen by the customers via their contract), or with a direct contractual relationship with an electricity supplier that is then transferred to the electro-mobility Service Provider. In the 'roaming of charging service' model, the charging station operator chooses the electricity supplier that is fixed at the public charging station. In roaming, electro-mobility is sold as a service and as a product 'charging' which includes a bundled service (time

used, parking, mobile app, etc). A regulatory issue in all roaming solutions is interoperability of data and exchange of information for 'roaming customers', which is indispensable for roaming.

The energy market regulatory context in Europe remains markedly heterogeneous. 'One solution fits all scenarios' are consequently unrealistic to apply and may even diminish competition and innovation. However major concerns regarding consumers' rights to choose an energy supplier of their choice must be addressed with both a realistic short term approach and an ambitious medium term vision. One issue related to the need to switching the energy supplier at the charging station, in some countries, is that only suppliers with a license issued in the country where the customer's request the recharging can actually supply the electricity. One solution to overcoming this is with roaming that enables an electro-mobility service to be delivered in a national market. As a first step, electricity roaming could be allowed in all of the countries where a specific supplier has a license. This situation could then evolve towards the establishment of new licenses, partnerships with local suppliers or a revised European regulation that allows the supplier to sell electricity with a global license.

Early incarnations of the Alternative Fuels Infrastructure Directive[13] stated the right of *electric vehicle owners* of purchasing electricity from any electricity supplier of their choice, which was subsequently removed in favour of the right of *charging station owners* of purchasing electricity from any electricity supplier of their choice. While presenting a challenge to the Internal Energy Market, further ramifications for electro-mobility will take shape as decreased consumer transparency on the purchase of electricity, lower cost transparency and, diminished competition on the energy market. For consumers increasingly concerned about emissions generated by vehicles, a means must be provided to choose the energy they want without restrictions imposed by charging stations. To encourage the **use of renewable energy** in charging electric vehicles, roaming solutions should empower consumers to easily be able to choose the type of electricity they would like to supply their EV.

5. Electric two-wheelers, micro-vehicles, cars and vans

Technological Barriers:

Although well above the European average daily driving range, EV's driving range continues to act as a question to EV purchase. When attaining a driving range of roughly 400-500km enabling easy inter-urban and international mobility EVs will be clearly a better alternative to ICE cars. To this end, battery costs need to drop significantly. Since 2008, battery costs were cut by a factor four and battery energy density had a fivefold increase, and studies predict that the cost of batteries will continue to decrease significantly over the next decade[14]. Batteries' lifespan needs to be prolonged, allowing them to charge faster, be lighter and safer, more technically reliable and easily recyclable. EVs' driving range will also need to be addressed through the establishment of fast-charging infrastructure in strategic spots. As for LEVs, so far, the success of electric scooters and motorcycles is very limited, because their range is still limited and their price-level is often unattractive compared to their ICE counterparts.

Regulatory Barriers:

[13] Directive 2014/94/EC

[14] http://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf. According to the IEA's global EV outlook, PHEV battery cost estimates fell from about USD 1 000/kWh in 2008 to USD 268/kWh in 2015, which represents a 73% reduction in seven years. The US Department of Energy considers that cost-competitiveness of PHEV batteries relative to conventional batteries will be achieved at USD 125/kWh by 2022 in the United States.

To stimulate supply and demand of EVs, but especially early adoption, some policy makers perceive the implementation of policy tools as a barrier, especially the granting of fiscal incentives to EVs as losses in the form of forgone tax revenue. But it must be noted that electro-mobility allows to save on health costs resulting from pollution. In all transition scenarios towards electrification, tailpipe emissions of health damaging pollutants, such as NOx would be cut by more than 85 per cent, with soot particles down by more than 70 per cent.[15]

As far as Light Electric Vehicles are concerned, current type approval regulation, which has originally been designed for conventional mopeds and motorcycles, represents a regulatory barrier. Today, only one type of light electric vehicle (LEV), the electric bicycle (e-bike) with pedal assistance up to 25 km/h and 250W, is successful in the EU (2014 sales were at ca. 1.5 million, representing 95% of the market). Their success has been facilitated by means of an adapted regulatory framework and legal certainty as to the categorization and terms of use for this vehicle on the road: Excluded from type-approval for mopeds and motorcycles and standardised by CEN, member states classified these vehicles as bicycles. This means a clear status on the road, whilst e-bike riders enjoy the same benefits as cyclists such as strict liability, fiscal incentives for cycling if any, reduced VAT-rates on repairs in certain member states and certain preferential traffic rules.
Type approval is required for all other LEVs, and poses a market entrance barrier, especially for innovative vehicle types that are purpose-designed and not derived from combustion equivalents. Furthermore, type approval requirements cause great uncertainty as to the terms of use. Electric bicycles up to 45 km/h for instance may be used in one member state without any helmet at all, while other member states impose a moped helmet. There is major confusion as to their status in traffic regulations, on insurance issues as well as to whether they qualify for cycling tax incentives for instance.

Economic Barriers:

EV's higher costs of ownership have meant they have so far been affordable only to the higher income segments of the population. In countries such as Norway, the purchase of an EV has become a cost-saving opportunity, as a result of the introduction by the government of a package of fiscal and other incentives giving EVs preferential treatment. This package of incentives is financed by introducing the polluter pays principle in the car tax system.
Awareness of the broad range of environmental, social and economic benefits offered by electro-mobility is lacking both among the public and policy makers. Consumers need to become more informed of the availability and affordability of EVs as an alternative to ICE cars. Public authorities, on the other hand, need to build capacity on electro-mobility and develop the necessary policy tools to enable its deployment.
As for LEVs, they suffer from a weak distribution and servicing network, lack of training and the availability of statistical data.

[15]ttp://www.camecon.com/Libraries/Downloadable_Files/Fuelling_Europe_s_Future-_How_auto_innovation_leads_to_EU_jobs.sflb.ashx

4. Solutions: What Europe should do to accelerate electro-mobility

Europe needs a comprehensive electro-mobility policy that combines the decarbonisation and modernisation of transport and energy sectors and addresses public health issues in urban and suburban environments.

1. Integrate intermodal electro-mobility into urban transport

Technological Solutions:

There is a continued need for all transport modes to invest in the competitiveness of their products and services through a sustained RDI effort that will require private and public resources, for example through Joint Technology Initiatives. Technological cross-fertilization should be encouraged between modes that use or are switching to electric power. The Platform observes a clear need for an increased support for RDI activities and for projects, such as ZeEUS and ELIPTIC, seeking synergies between various electric modes of transport in cities, or on FREVUE Project and links between long distance road transportation and the last mile delivery. The Platform supports efforts to build appropriate infrastructure as a means to ensure smooth and swift integration of e-buses, e-car sharing options and e-bikes into the public transport network.

Regulatory Solutions:

In order for the Public Transport Authorities and Public Transport Operators to be able to benefit from the provision of a charging infrastructure, there needs to be legal clarity as to the possibility for public transport operators and organising authorities to sell energy to private customers and under what conditions. The platform encourages the launch of a study assessing legal regulations concerning the selling and reselling of energy throughout the EU.

The Platform would further support an EU Joint Initiative on electro-mobility to gather the industry, operators and local/regional authorities and ensure a further deployment of electro-mobility. Joint Initiatives (JI) already exists in many different transport sector or special technologies such as Fuel Cells and Hydrogen. In order to tackle technology issues, a JI would allow the industry, Public Transport Authorities and Public Transport Operators to have a common platform to fully deploy electro-mobility without compromising the long-term investment perspective needed for this new form of transportation.

At the local level, this could also be articulated with guidelines on how to simplify Sustainable Urban Mobility Planning (SUMP) and Sustainable Energy Action Plan (SEAP) process in terms of electro-mobility in cities. The Covenant of Mayors together with the Energy/Climate package introduced concrete local solutions to tackle climate change, notably through the Sustainable Energy Action Plans. Electro-mobility falls under both Strategic Plans. Electro-mobility as a transversal component of the cities' policy masterplan needs to be facilitated. A multimodal approach to electric mobility needs to be promoted by EU guidelines for the use of electro-mobility in cities, either in form of including electro-mobility components into SUMPs to be reviewed in 2017 or as an appendix, providing a separate comprehensive set of guidelines on 'electro-mobility in cities'.

Recommendation from previous EU-funded projects[16] shows that a successful electro-mobility interchange model requires an integrated governance gathering private partners, be it the industry, property management, advertising or technology providers, and different level of public authorities, rural/local, metropolitan and regional, both at the infrastructure management and at an operating level. The platform suggests funding a future project under Horizon 2020 on the governance model at the interchange, in order to provide concrete recommendations to further enhance the electro-mobility interaction with other modes of transport.

Continued public support remains necessary both to reinforce the public transport infrastructure – the backbone of smooth urban mobility - and to facilitate the deployment of low capacity electro-mobility solutions, from e-cars to electric two-wheelers. Available public support (grants, loans or guarantees) need to be earmarked so as to ensure the achievement of the 2011 White Paper goal of a clean urban transport and commuting.

In order to maximize EFSI's impact on the electro-mobility sector, it is also important to provide predictability on the interpretation of EUROSTAT's provisions regarding debt consolidation for public-private partnerships for electro-mobility infrastructure projects, and in particular a flexible component for PPPs inclusion of the incurred debt under the EU Stability and Growth Pact (SGP).

Economic solutions

There are already existing initiatives to align demand and supply, like the C40 Clean Bus declaration[17], in which major cities throughout the world collaborate on showcasing demand for clean buses, including e-busses. The Platform calls for support to such initiatives aiming at scaling up demand for clean buses including electric buses and improve the offer.

The platform acknowledges that the increase in use of electric vehicles has to be accompanied by an increase in funding available to clean technologies in transport. Initiatives have to be also taken at the national level to support the deployment of electric buses. One model example is the Green Bus Fund in the UK that ran from 2009-2013 and provided funding for low emission buses. Due to its success, it was followed by the Low Emission Bus Scheme, granting funds to offset the higher costs of low emission buses and to support authorities and operators' purchase of necessary infrastructure.[18]

2. Help rail achieve its full potential in electric mobility

Technological Solutions:

The industry is committed to develop, through R&D projects such as OSIRIS (urban transport), MERLIN (mainline) and from 2015 Shift2Rail, innovative energy efficient solutions for both urban and main line transport. The rail sector is continuously seeking to improve energy efficiency performance, which includes the development of more efficient and lighter traction chains, innovative propulsion systems (hybrid, battery, fuel cells), driver advisory systems, energy recovery and storage systems as well as innovative designs for trackside electrification.

Regulatory Solutions:

[16] EU NODES project, http://www.nodes-interchanges.eu/
[17] http://www.c40.org/networks/low_emission_vehicles
[18] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382165/30m-bus-scheme.pdf

The EU's Transport White Paper's (2011) long-term vision for a new transport system attributes a key role particularly for medium and long distance passenger and freight rail. This requires increasing the length of the rail network and maintaining a dense railway network in all EU Member States. Transport White Paper gives more weight to environmental and safety criteria in the selection of EU funded transport infrastructure projects. The Platform demands this condition to be strictly applied.

EU policies should facilitate innovation for energy efficiency and energy management in railways.

The Platform requests correct transposition of the 2014 Public Procurement directives to select solutions based on their environmental footprint and life-cycle costs.

The railway system is a complex and interconnected system, in which a single supplier, operator or infrastructure manager cannot tackle the energy management issue for the entire network alone. A collaborative approach should be preferred to create synergies between the different actors of the railway system to maximise the system energy management.

While technological innovations have already increased the possibility to recover energy when braking, contributing to making railway transport even more eco-friendly, the possibility to use this technology depends not only on track and cabling systems but also on a suitable legal framework that enables public transport operators to reuse recovered energy in the most efficient way (resell it to the grid as renewable energy).

Economic Solutions:

Revenues could be earmarked for the further promotion of low-carbon modes. In the context of Europe's high dependence on imported fossil fuels, it may be valid to argue for further increases in fossil fuel taxation, with revenue recycling in favour of transport solutions based on much lower consumption of fossil fuel imports, including rail-based solutions.

Finally, the Platform invites policy makers to pursue a win-win strategy by linking energy and transport policies. More electric rail traction leads to transport decarbonisation and electricity decarbonisation as well as increased energy security

3. Foster smart charging and storage solutions for electric vehicles

Technological Solutions:

Grid-to-vehicle:
Developing cross-industry smart charging technology solutions and services i.e. intelligent ICT charging infrastructure is crucial. Smart charging devices and services relate to interfaces between the electricity grid, the charging infrastructure and the electric vehicle (e.g. energy management systems, back-end systems, automated meter readings, etc). Therefore smart charging offers wide-scale opportunity for cross-industry innovation not only for the electricity industry but for all electro-mobility stakeholders involved including ICT providers, charging station equipment manufacturers and car manufacturers.

Vehicle-to-grid:

Research projects should be promoted to better understand the impact of V2G on the degradation process of batteries. Horizon2020 funds and the research activity of the European Interoperability Centre for Electric Vehicles and Smart Grids should take this particular field of research into account to develop technical solutions and allow a proper use of batteries for V2G services avoiding sensible battery degradation.

Regulatory Solutions:

Grid-to-vehicle:
Smart charging should be incentivised so that charging takes place at times when electricity supply is plentiful – i.e. from excess renewables, and when prices and demand are low. Giving consumers the option of real-time retail pricing represents a key enabler. Consumers should also have the choice to contract with an independent service for alternative services.
Equally important is the grid friendliness of the charging process taking into account volatile grid capacity on the local level to avoid unnecessary grid extensions. The regulatory regimes must incentivise retailers and DSOs to invest in and use smart charging solutions, including innovative grid fees and/or ICT infrastructure financing models, allowing DSOs to manage their grids more intelligently and retailers to offer innovative smart charging services to customers.
Smart charging solutions to reducing costs for the environment, for the power system and for the customers should be actively promoted. Customer participation in smart charging is only possible if customers receive clear financial benefits. Customers can benefit from reduced energy costs and cheaper electricity prices when using electricity at times of lower demand. Strategies to encourage a shift in behaviour include efficient price signals (time-varying prices) or smart contract based control signals.
Efficient multimodal electro-mobility (see above) can maximise the periods when EVs are connected to the grid, through for example incentivizing EV drivers to park their car and continue their journey into city centres by public transport.
EU-wide standardisation, interoperability and an efficient exchange of information between all electro-mobility players need to be ensured (see below). This includes to agree and develop common interoperable standards (both at physical and ICT layers) and on clear actor definitions and roles for smart charging and aggregators.

Vehicle-to-grid:
The European legislation on energy storage should be clarified to eliminate unintended legislative uncertainties and disincentives to the deployment of V2G.
An appropriate definition of energy storage and energy storage services should be developed and agreed at the EU level and included in the incoming proposal on New Energy Market Design to allow for a coherent approach on energy storage, leading to the harmonisation on internal market and the removal of double grid fees. This includes also the removal of barriers to the participation of small players to the energy and balancing trading markets, together with the development of a coherent framework with duties and rights of new players such as aggregators.

Economic Solutions:

Grid-to-vehicle:
Demonstration and commercialization of both G2V and V2G need to be prioritized. Private and public actors have to increase cooperation to enable the roll-out of solutions that can be deployed at large scale, enabling real-world validation of RD&D findings.

Charging infrastructure, including successful business models based on a combination of both public and private investments for its deployment is key, including European financial support to national and inter-national corridors (see below).

Vehicle-to-grid:
Vehicle-to-grid business models should be developed on an equal footing with other sources of flexibility, avoiding inefficient subsidies. Potential costs of battery round trip efficiency losses and increased battery degradation should be considered in the business model. Cost reductions for a V2G commercial case could come from technological advancements, while the source of revenue should be better explored and defined, with particular regards for the ancillary and balancing service market.

4. Roaming and smart metering for interoperable charging services

Technological Solutions:

Standardisation
To overcome the challenges faced by electro-mobility standardisation, in addressing the integration of electric vehicles in the home and interoperability, a number of measures should be implemented by the European Union. While the pre-eminence of legislation must remain the case, there is a clear need for standardisation activities to be prioritised so that European Union policy goals can be met.

Such initiatives should takes shape as the increased strategic coordination of electro-mobility standardisation at EU level, through greater prioritisation in ongoing European mechanisms such as the Rolling Plan for ICT Standardisation, and the greater involvement of the European Commission in electro-mobility standardisation needs. This needs to be complemented by a priority given to European standardisation for the development of standards mandated by the European Commission for the implementation of legislation and policies. In addition, improving the balance of representations in the European Standardisation Organisations (ESOs), such as research academia, societal stakeholders, SMEs and the output of research projects, will contribute to strengthening standards. Taken together, these measures can help ensure that standards reflect European policy objectives and the needs of markets and society.

Smart Metering
As the electro-mobility market-share grows in Europe, new use cases are likely to appear as end-user demands evolve with respect to opportunities afforded by electrification of Europe's transport systems. Smart metering of electricity presents new options for improving collaboration between grid operators and end-users, smoothing net loads on European grids, strengthening system reliability and providing new business opportunities. At present, Stationary Metering and On-board Metering are two potential solutions to fulfil this role, but both must be subject to a careful cost-benefit analysis and market developments, in line with end-user needs.

Stationary Metering employs Smart Meters as an integral part of a recharging station, allowing control or price signals to be communicated to the electric vehicle when smart charging. Once established, the meter can act as a gateway between the end-user and the operator, measuring energy usage in high detail and provide charging data to both parties. Electro-mobility service providers can then offer smart charging, with recharging based on a combination of price and technical signals. This opens up a number of possibilities for consumers, grid operators and society, reducing energy costs, reducing grid reinforcement needs and optimising demand.

On-board Metering (OBM), like Stationary Metering, enables smart charging of electric vehicles but measures consumption of electricity within the vehicle. OBM takes current European energy infrastructure and telecommunications infrastructure as it exists, with primarily non-'smart' power outlets and widespread penetration of wireless communication technology. At present, the majority of EVs offer wireless connectivity, via a 'mobility centre' or equivalent, which would serve as the primary communications infrastructure. Implementation of OBM would enable all electricity consumed within the vehicle to be measured transparently and therefore allow for the possibility of accounting for renewable energy consumption. In addition, the technology opens up the possibility of measuring electricity consumed from innovative charging solutions, such as eHighway power lines (catenary lines) and wireless charging, simplification of roaming solutions, reduced system costs and greater asset utilisation of existing infrastructure.

Regulatory Solutions:

The aim is to ensure EU-wide standardisation, interoperability and an efficient exchange of information between all electro-mobility players. Any solution needs to agree and develop common interoperable standards (both at physical and ICT layers) and on clear actor definitions and roles for smart charging and aggregators.

Roaming

In order to allow all EV users simple and transparent access and payment systems for charging infrastructure, roaming needs to evolve in two phases of roaming are required.

Firstly, EV roaming between charging point operators is essential and different market models exist. EV users need to be able to charge with one contract at different charging stations served by different operators and suppliers.

Secondly, roaming between electricity providers needs to be enabled to allow customers to choose to aliment EVs with renewable energy. Electricity roaming is a market scheme, which allows EV drivers to benefit from a specific electricity supply wherever they charge. This model gives to any consumer the ability to choose a single electricity supplier which sets in place for each charging instance specific measures defined by contract. As is the situation for the mobile phone industry, electricity roaming provides the opportunity for consumers to easily change their preferred energy supplier; incentivising suppliers to provide high quality service, and offer options for sourcing environmentally clean energy supplies. In addition, consumers are able to achieve the same quality of service in any place they charge in a seamless way. Studies have demonstrated that a large proportion of charges will take place beyond the home in a roaming situation and this must be catered to. In this regard, electricity roaming has the following advantages:

- Improved awareness of consumers to harness the benefits of renewable energy when recharging their vehicles
- Increased cost transparency for consumers
- Simplification of the user experience and improved user satisfaction
- Greater competition of energy markets, supporting EU objectives for an internal energy market

5. Incentives for electric two-wheelers, micro-vehicles, cars and vans

Technological Solutions for LEVs

The type approval categorization issues have negative repercussions for the inclusion of LEVs in European funding programmes. As an example, for lack of awareness, LEVs are hardly acknowledged in the European Green Vehicles Initiative (EGVI) and consequently in the relevant Horizon 2020 programmes. This issue can be solved by involving the relevant LEV stakeholders in the EGVI.
The legal uncertainty governing the use of LEVs also has serious implications. Any European project proposal related to the demonstration and testing of these vehicles is confronted with and hampered by serious insurance issues. The European Union needs to step in to assist in solving these matters.

Regulatory Solutions:

Green Public Procurement (GPP)
Public authorities are a powerful purchaser on the market and are therefore key actors in the decarbonisation of transport.[19] In March 2015, 30 European cities, whose collective purchasing power amounted to approximately €10 billion a year, signed a declaration committing themselves to purchasing eco-friendly products. GPP is a unique tool for stimulating demand for EVs, raising trust in the technology among both consumers and manufacturers by demonstrating its use. The uptake of EVs through the European Clean Vehicles Directive (CVD)[20] has remained slow, as the Directive fails to address privately contracted services such as road maintenance, waste disposal, and elderly/disabled transport, which involve a significant element of transport. An extension of the scope of the CVD is necessary to rectify the currently omitted segments, such as L-category vehicles. What is more, the CVD needs to mandate minimum requirements for public purchasing replacing current vague criteria.

While enacting GPP policies is of crucial importance in building confidence and stimulating demand for EVs, the reduction of the carbon footprint of public fleets requires a comprehensive approach to fleet management. This necessitates looking beyond the simple purchase of new vehicles. EU Member States should therefore establish national/regional capacity building centers to provide free advice and training to public authorities and other large fleet operators. These centers should provide expertise on driver training, reducing wasted mileage, appropriate maintenance, and retrofitting. This wider mobility management approach should also encourage public authorities to rethink their mobility needs, and ensure thorough assessment of the need to purchase (or lease) a vehicle, and the consideration of car sharing, and employee incentive schemes among others.

Establishing an interoperable European EV charging infrastructure
Inter-urban and international EV mobility will depend on the construction of a truly interoperable EV re-charging infrastructure across Europe. The Alternative Fuels Infrastructure Directive is an important step in the right direction as the establishment of a Europe-wide market for EVs instead of fragmented national ones would further lower costs and help to eliminate consumer anxieties. For the substantial share of EV charging that will be done at home or at work, new buildings (parkings) should be equipped with EV charging facilities and there should be incentives to 'retrofit' buildings, public car parks etc., for companies or private owners. Fast charging infrastructure should be set up where demand is, as currently done along the TEN-T transport corridors in Europe, in order to ensure sufficient driving range for inter-urban and international journeys[21]. While an accessible and common European charging infrastructure is an important condition for market take-up, current fast charging solutions that compete with the prescribed standard in the Directive should not be prevented from implementation on private charging points if they encourage EV use. If turning into a barrier for the uptake of the electro-mobility market, the current charging infrastructure standard requirements need revision.
Deployment of fast charging infrastructure will be also a key enabler for the uptake of electric vehicles. The Platform therefore recommends continuous financial support of EV charging infrastructure, in particular

[19] World-wide 557,000 cities and communities spend roughly €4 trillion per year; the equivalent of 10% of global GDP.
[20] Directive 2009/33/EC
[21] Norway will establish at least two fast charging points every 50 km on the main roads.

1. EU/Public financial support to investments looking at establishing national and inter-national corridors,
2. EU/Public financial support to projects looking at installing quick charging stations in urban environments
3. facilitated investments into appropriate charging infrastructure at semi-public areas (shops, car-parks, etc)
4. Financial support for investors in the first years of operations in situations where the number of BEVs is not yet sufficient to make their business model fully sustainable

Raising public awareness

While the introduction of policies and incentives to both car makers and consumers are crucial in fostering the transition to an electrified EU transport sector, it is important to note that the effectiveness and practical feasibility of these measures will to a great extent depend on the public perception and awareness of electromobility and its associated benefits. The state of California, another EV success story, shows that consumer awareness campaigns and other local initiatives like the use of High Occupancy Vehicle Lanes which was also adopted in Norway have been key in informing the public of the various environmental and economic benefits the purchase of an EV may offer. Experience from Norway[22] shows that EV owners are the best 'ambassadors' inciting on average three of their neighbours, friends or colleagues to buy an EV.

Regulatory solutions for LEVs

The type approval regulation for mopeds and motorcycles needs to be fundamentally scrutinized for the benefit of LEVs. Perhaps this should be done under the REFIT programme. With that it should be noted that the Impact Assessment carried out before designing the Light Vehicles Type Approval Regulation[23] did not take LEVs accurately into account. We believe that a separate technical regulatory framework for these light vehicles is the only effective way forward.

In order to remedy the legal uncertainty, the technical legislation in combination with the legislation governing the use of the vehicles needs to be put through a Fitness Check for the benefit of harmonization aimed at improving coherence and legal certainty. Furthermore, the Commission needs to investigate the need for further European harmonization, for instance in the field of helmet rules.

So far, scientific research is not being used as an element in developing legislation. For lack of use of scientific data, legislative consultations and decisions have too often been based (and still are) on emotional argumentations. The Commission needs to establish a relationship with academic institutes that are working on the issue of LEVs and should provide for a mechanism, which ensures the use of scientific data as an element in decision-making.

Economic Solutions:

To make EVs competitive vis-à-vis ICE cars and therefore boost demand, EVs need support through targeted policies. A recent study in Norway has shown that 41% of EV buyers consider cost-savings as the primary reason for buying an EV.[24] The Norway case also shows that the choice of fiscal incentives package will therefore largely depend on the characteristics of each EU Member State in mind, such as the level of car ownership tax burden, the VAT rate, the cost of electricity and fuel prices. The choice of incentives will vary depending on the **goals** of each Member State, which could include the goal of industrial growth (via EV production) or the goal of balancing electricity generation (via EV batteries' storage of electricity).

[22] http://elbil.no/elbilforeningen/dokumentarkiv/finish/10-dokumenter/382-norwegian-electric-car-user-experiences-2014

[23] Regulation No 168/2013 and associated Regulations

[24] In Norway, the introduction of a comprehensive package of fiscal and practical incentives such as purchase tax and VAT exemptions; exemptions from road and ferry tolls; free parking and re-charging in public charging spots; and the ability to drive in bus lanes has been effective at fostering the greater uptake of EVs (17 % BEV market share in 2015). See http://network.bellona.org/content/uploads/sites/3/Bellona-EV-Brief_The-Norwegian-Success-Story1.pdf

There needs to be a **bottom-up approach** to the adoption of EV incentives, whereby national or local authorities select the combination of EV incentives best suited to them. While **fiscal incentives** are crucial, experience shows that there are limits to how much they can achieve on their own, highlighting necessity for these to be accompanied by **practical benefits** to EVs, parking benefits especially in urban environments.

A full discussion of different EV incentives can be found in the annex to this paper.

Economic Solutions for LEVs

Quite a few member states have taxation measures and/or fiscal incentives for electric cars and/or for cycling. In both cases, most LEVs are being overlooked, since they are categorized as mopeds or motorcycles for which there is no distinction between electric or otherwise fuelled. The Commission's 2013 "*Guidelines on financial incentives for clean and energy efficient vehicles*" do not sufficiently recognize the potential contribution of LEVs to decarbonisation. Furthermore, although the scope of the guidelines does include L-category vehicles, the guidelines miss their mark for lack of policy coherence. The Clean Vehicles Directive (2009/33) for instance does not include L-category vehicles, which means that in fact the EU excludes LEVs from clean procurement. A very important condition for the uptake of LEVs is to have the vehicles visible in the streets. Public procurement is an instrument that can play an essential role in this, whilst the offer of LEVs for public services is ample.
Another potential area for taxation measures is VAT. The EU should grant the member states the possibility to apply at least the reduced VAT-rate on LEVs. VAT and other taxation measures have been to a very large extent at the basis of the success of electric cars in Norway. The overall external cost reduction resulting from increased LEV use will undoubtedly compensate for the loss of VAT revenue.
The LEV business has a very considerable potential to create green jobs. LEV businesses promote sustainable alternatives to car usage, which can significantly help decarbonize and facilitate traffic in cities. This in turn improves logistics for companies delivering in cities. In conclusion, the LEV business can play a major role in reducing the environmental footprint of economic activity.
However, the European LEV business faces a number of challenges. As an example, the boom of electric bicycle sales is creating a need for new skills and training schemes to adapt to the new jobs related to the sale and maintenance of electric bikes. Furthermore, the sector faces difficulties in attracting new workforce. European funding programmes could play a facilitating role in all this. Since the overall majority of the companies in the LEV business are SMEs, they require easier access to European funding programmes and less administrative burdens involved in carrying out European projects.

5. Next steps

The decarbonisation of transport through electro-mobility is a key component of delivering the Europe's climate goals, but also to reach the Energy Union's goals to decarbonise the European economy, to contribute to energy security and to create innovation and competitiveness in Europe's core industries. The upcoming **European communication on the Decarbonisation of transport** provides the ideal opportunity to make detailed proposals in the areas identified above to help deliver these objectives. The Platform would welcome an opportunity to discuss the proposed solutions.


ABB


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The European Association
for Electromobility


BELLONA
EUROPA


CER


ECOS


EIM


eurelectric


EUROBAT


POLIS


RENAULT NISSAN


SEDC
Smart Energy Demand Coalition


TRANSPORT &
ENVIRONMENT


UITP
EUROPE


unife
THE EUROPEAN RAIL INDUSTRY

Annex

EV-incentive types, Member State characteristics and type of use they are most effective.

EV incentive type	Explanation	Best applicability in MS with the following characteristics & type of use
CO_2 taxation at registration	***Bonus-malus system*** ● budget-neutral, taxing heavier polluters more and vice versa ● tax reductions to EVs need to come with tax raises for ICE cars to avoid tax deficits/ public revenue ● negative impact on poorer population segment ● public acceptance issues	● most effective in countries with heavier tax burdens ● may be temporary measure to help market uptake ● or applied to commercial EVs or light EVs only
VAT exemptions	***Bonus-malus system*** significant incentive for EV purchase depending on existing VAT rate	more effective in countries marked by particularly high VAT rates (e.g. Norway)
Fuel taxation	● would result in greater purchase of less polluting cars and EVs ● affect both the choice of car and the driving behavior ● public acceptance issues, higher tax burdens disproportionately affecting the poor (for EVs only)	Greater estimated fuel cost savings and incentive to switch to EV in countries with relatively high gas prices and low electricity tariffs
Access restriction schemes and congestion charge	● Zero- and Low Emission Zones (LEZ) or Road Pricing (congestion charging) allow the exemption of EVs from these access restrictions ● discrimination of ICE cars fosters EV uptake ● growing concerns for public health due to air pollution make the adoption of these feasible	ct emission criteria are needed coupled with accurate emission testing (e.g. UK, Italy, Netherlands, Germany, some cities in Poland, Czech Republic, Austria and Hungary[25])
Parking benefits	● parking space is a rare commodity in many cities – any incentives for EV owners with regards to parking could foster EV uptake. ● entails loss of public income ● To avoid significant income deficits, the grating of free/reduced parking to EVs should be accompanied by a raise in the parking fee levels for ICE cars ● issue of public acceptance	be combined with charging infrastructure at dedicated parking areas (particularly effective in Norway)

[25] http://urbanaccessregulations.eu/