BELLONA EUROPA brief

Why an electrified transport sector needs to form a core component of the Energy Union

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Transport constitutes a large and untapped sector for significant amount of cost effective mitigation potential. Meeting the EU's target of reducing CO_2 emissions from transport by 60% and of eliminating the use of fossil fuels in cars by 2050 will, however, necessitate significant and immediate efforts. Bellona sees electric vehicles (EVs), in particular, as representing one of the most promising technologies for cutting CO_2 emissions, reducing petroleum reliance and improving local air quality. EVs will, furthermore, help to optimise the ever increasing use of renewables and increase the predictability of the electricity sector, as EV batteries can be re-used to store and manage wind and solar-based electricity. The European Commission's recently released Communication on the State of the Energy Union 2015, however, fails to acknowledge the importance of electro-mobility and the multiple benefits it would offer in the strived-towards European Energy Union. The European Commission's Communication on the Decarbonisation of Transport, expected in early 2016, therefore offers an important opportunity to highlight the key role of electro-mobility in decarbonising the transport sector, currently responsible for one third of greenhouse gas emissions in non-ETS sectors. This brief outlines the benefits of e-mobility as well as the key challenges to its wider uptake, and goes on to provide a number of recommendations to European leadership in attaining electrified European transport.

E-mobility: one answer, multiple benefits

In full recognition of the wide range of benefits that EVs offer, the EU Energy Union Strategy highlights that "*Europe needs to speed up electrification of its car fleet and other means of transport and become a leader in electro-mobility*" (European Commission, 2015). The wider uptake of e-mobility in the EU would entail significant benefits in terms of decarbonising the transport sector; boosting energy security and cutting reliance on fossil fuels by means of re-usage of EV batteries for energy storage purposes; and last but not least, improving local air quality and reducing health risks associated with air pollution.

EVs as a tool for transport sector decarbonisation

Currently, passenger cars are responsible for over 15% of total CO_2 emissions in the EU. The global car fleet is predicted to double from 800 million to 1.6 billion vehicles by 2030. The IEA finds that three-fourths of global car sales will need to be in EVs or plug-in hybrids by 2050 if the transportation sector is to do its part in limiting global average temperature increase to 2°C (IEA, 2013).

EVs as a means to boost energy security and cut reliance on fossil fuels

Additionally and very importantly, EV batteries will provide flexible energy storage to variable renewable

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power and thus help to increase the predictability of the electricity sector. This in turn will help in reducing oil imports and in boosting Europe's energy supply security.

Did you know? Bellona has found that when used battery packs of the current stock of 4 million EVs sold from 2010 to 2015 are given a new life in the energy sector, the result would be a storage capacity of 128 GWh. This is sufficient to store and release almost all of Germany's daily capacity from solar power in peak periods in the summer. With the 20 million EVs that are anticipated to be sold globally by 2020, the storage capacity will exceed 640 GWh, and continue to grow thereafter[1]. In the absence of energy storage, polluting, expensive and under-utilised fossil power plants remain on the grid as back-up power, while being subsidised by consumers. With energy storage, industries and private persons can store the solar power installed on their own roofs, thereby ensuring a secure energy supply and eliminating the need for back-up power from fossil energy.

EVs as a solution to air pollution

The recent Volkswagen scandal resulted in important revelations about emission test manipulations being commonplace across the entire car maker industry. A number of recent reports, including those by Transport & Environment and the ICCT, have brought attention to the ever increasing mismatch between reported and on-road emissions, and the economic, environmental and most of all human health-repercussions these have entailed. Lax EU emission testing rules exacerbate our already heavily polluted urban areas[2]. A recent report of the EEA, estimates that air pollution continues to be responsible for more than 430 000 premature deaths in Europe, making it the single largest environmental health risk on the continent[3]. EV uptake will help in cutting pollutants emitted by conventional ICE-cars, such as SO_x, NO_x, and particulate matter, and thus improve local air quality.

What are the key barriers?

Despite these significant benefits EVs offer, they still account for just 0.3% of the total market of around 12.55 million passenger cars sold during 2014 in the EU[4]. This is the result of a number of perceived or actual regulatory, financial and psychological barriers.

Higher costs of ownership vs. revenue loss for public authorities

Firstly, EVs' higher costs of ownership have meant they have so far been affordable only to the higher income segment of a population. In countries, such as Norway, the purchase of an EV has been rendered a cost-saving opportunity as a result of the introduction by the government of a generous package of fiscal and practical incentives[5]. Noteworthy, however, is that costs of rendering EVs affordable has been incurred by Norway's public authorities in the form of revenue loss from forgone tax income and parking fee collection for instance.

Limited driving range

Perceived or actual shortage of charging points, as well as the lack of compatibility between these, are important factors undermining consumer confidence in the EV technology. It is crucial to address these barriers via investments in battery improvements to enable longer driving range and the build-up of fast-charging infrastructure in strategic points.

Lack of public awareness

Awareness of the broad range of environmental, social and economic benefits offered by e-mobility is missing 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 the topic of e-mobility and the necessary policy tools to enable its deployment.

Bellona's recommendations:

In order to render EVs competitive vis-à-vis ICE cars and therefore boost their demand, it is important to ensure long-term government support in the form of targeted policies, including fiscal and practical benefits, and preferential treatment.

[1] *The Disruptive World of Large Scale Energy Storage*, Bellona Europa, 2014: http://bellona.org/assets/sites/4/Bellona-Brief_Energy-Storage_and_Electric_Vehicles_30_10_14.pdf

[2] The Emission Testing Gap: Why business-as-usual for the conventional car industry cannot continue, Bellona Europa, 2015: http://network.bellona.org/content/uploads/sites/3/2015/11/Bellona-EV-Brief_The-Emission-Testing-Gap.pdf

[3] *Air Quality in Europe – 2015 Report*, European Environment Agency, 2015: http://www.eea.europa.eu/publications/air-quality-in-europe-2015

[4] ACEA, 2015: http://www.acea.be/statistics/tag/category/key-figures

[5] *Electric Vehicles: The Norwegian Experience in Overcoming Barriers,* Bellona Europa, 2015 http://network.bellona.org/content/uploads/sites/3/Bellona-EV-Brief_The-Norwegian-Success-Story1.pdf

The importance of the carrot component: fiscal & practical incentives to EV buyers

41% of EV buyers in Norway have considered cost-savings as the primary reason for buying an EV. This has been made possible due to the generous package of fiscal incentives and practical benefits the Norwegian government has granted to EV buyers. These have included exemptions from purchase tax and VAT; more affordable insurance; exemptions from road and ferry tolls; free parking and re-charging in public charging spots; and the ability to drive in bus lanes.[6] While the introduction of these incentives has been effective at fostering the greater uptake of EVs in Norway (i.e. one out of every four newly sold cars in Norway is an EV), it is important to note that their replication in EU Member States would not guarantee the same outcome. This is because, Norway's success story has been made possible by a combination of factors unique to Norway, namely its particularly high purchase tax and VAT rates, as well as considerably low prices of electricity, 98% of which is derived from renewable energy sources. Granting exemptions to EVs from those high purchase and VAT taxes has therefore had an enormous effect, as being subjected to these taxes in Norway can double or even triple the car's purchase price.

No 'one-rule-fitting-all' solution. The choice of fiscal incentives package will largely depend on the ***characteristics*** of each EU Member State in mind, such as for instance, the level of car ownership tax burden, the VAT rates, the cost of electricity, and gas prices among others. Furthermore, the choice of incentives will vary depending on the ***goals*** of each Member State in mind, which could include the goal of industrial growth (via EV production) or the goal of balancing electricity generation (via EV batteries' storage of electricity). Therefore, a ***bottom-up approach*** to the adoption of EV incentives is needed, 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, and thus highlighting necessity for these to be accompanied by practical benefits to EVs, such as access to bus lanes (where this does not entail negative interference with public transportation) and parking benefits, along with public awareness campaigns[7].

This table provides a list of EV incentives and the pre-conditions, in terms of Member State characteristics, for their effectiveness to foster EV uptake:

EV incentive	Justification	Best applicability in MS with following characteristics
CO_2 taxation at registration **VAT exemptions**	A *bonus-malus* system should be introduced, whereby heavier polluters are taxed more heavily. This measure is budget-neutral as EVs are granted tax reductions.	These measures are most effective in countries with heavier tax burdens as they have more freedom in incentivising EVs by reducing tax burdens/VAT rates (e.g. Norway)
Fuel taxation	Consumers are price sensitive, so a rise in the fuel taxation would result in greater purchase of less polluting cars and EVs. This measure would affect both the choice of car and the driving behaviour.	The estimated fuel cost savings, and therefore the incentive to switch to an EV, would be greater in countries with relatively high gas prices and relatively low electricity tariffs (e.g. Norway).
Access restriction schemes **Congestion charge**	The discrimination of ICE cars always fosters EV uptake. The growing concerns for public health due to air pollution, renders their adoption more feasible.	Strict emission criteria (coupled with accurate emission testing[8]) should be ensured to guarantee effectiveness of the measure (e.g. UK, Italy, Netherlands, Germany, and some cities in Poland, Czech Republic, Austria and Hungary[9]).
Parking benefits	To avoid significant income deficits for city councils, the grating of free/reduced parking to EVs should be accompanied by a raise in the parking fee levels for ICE cars.	In general, since parking space is a rare commodity in many cities – any incentives for EV owners with regards to parking could foster EV uptake.

[6] *Electric Vehicles: The Norwegian Experience in Overcoming Barriers,* Bellona Europa, 2015 http://network.bellona.org/content/uploads/sites/3/Bellona-EV-Brief_The-Norwegian-Success-Story1.pdf

[7] *Increasing the competitiveness of e-vehicles in Europe*, Erik Figenbaum et al, 2015

[8] *The Emission Testing Gap: Why business-as-usual for the conventional car industry cannot continue*, Bellona Europa, 2015: http://network.bellona.org/content/uploads/sites/3/2015/11/Bellona-EV-Brief_The-Emission-Testing-Gap.pdf

[9] http://urbanaccessregulations.eu/

Fair taxation and its dependence on accurate emission testing

To truly reflect the societal and environmental costs of the fossil car industry, Bellona calls for the tightening of CO_2 emission performance standards for new passenger cars, set by Regulation (EC) 443/2009. A target of 70g/km for 2025 should be the absolute minimum level of ambition. Reported emissions data has been used by governments not only as an indicator to set new public health policies but also to simulate future air pollution and CO_2 levels and targets. This means that in order to ensure fair and correct taxation of ICEs, hybrids and plug-in hybrids, we firstly need to ensure accurate emissions data. Despite the planned replacement of the current NEDC system with the World Light Duty Test Cycle (WLTC), there is overwhelming evidence suggesting that this will only be a short-term fix to the mismatch between reported and on-road vehicle emissions. The ICCT predicts that the tougher WLTC regime would narrow the gap to around 23% but automakers would continue to be able to exploit a number of loopholes. As a result, the gap could again grow to 31% after 2020[10]. To ensure accurate and representative emissions data we need to see the establishment of an independent EU type-approval authority, operating under a clear and transparent mandate. The EU should draw on the US system in ensuring third-party monitoring and sporadic checks are being conducted. Test driving should be carried out under realistic conditions representing real-world weather and road conditions. The emissions data should be made publicly available on the Commission's website to trigger car makers to improve performance ('naming and shaming') and allow consumers to make informed purchase decisions. The maximum discrepancy allowable between reported and actual emissions under the new EU test should not exceed 10%. Because the real-world discrepancy of emissions data for hybrids, and in particular plug-in hybrids, has been even greater than for ICE cars, tax incentive schemes and available charging structure should be put in place to encourage users of plug-in hybrids to recharge their vehicles more frequently[11].

From green public procurement to beyond procurement

Public authorities are a powerful purchaser on the market and are therefore key actors in transport decarbonisation. World-wide 557,000 cities and communities spend roughly €4 trillion per year; the equivalent of 10% of global GDP'. Green public procurement (GPP) policies can act as a unique tool to build trust in EVs and stimulate demand for the technology. GPP in the EU has been regulated via Directive 2009/33/EC (also called the Clean Vehicles Directive or 'CVD')[12]. The uptake of EVs and full application of the CVD by EU public authorities has remained slow, however. Importantly, the CVD fails to address an important area of potential public procurement influence: companies contracted by public authorities to provide various services – such as for instance, road maintenance, waste disposal, and elderly/disabled transport services among others. While the revision of the CVD was recently completed, it is important to keep into account its shortcomings and the ways in which conducting of GPP could be rendered more effective at fostering EV uptake. Moreover, while enacting GPP policies is of crucial importance in building confidence in 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 and regional capacity building centres to provide free advice and training to public authorities. This wider mobility management approach should also encourage public authorities to rethink their mobility needs, and ensure thorough assessment of whether the purchase (or lease) of a vehicle is necessary in the first place, and the consideration of car sharing, and employee incentive schemes.

[10] *Quantifying the impact of real-world driving on total CO_2 emissions from UK cars and vans*, ICCT, 2015: https://www.theccc.org.uk/wp-content/uploads/2015/09/Impact-of-real-world-driving-emissions-for-UK-cars-and-vans.pdf

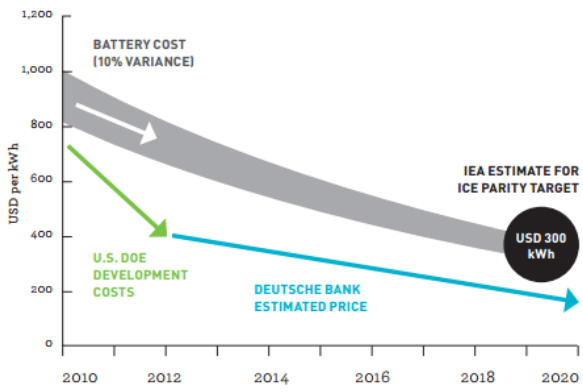
[11] *The Emission Testing Gap: Why business-as-usual for the conventional car industry cannot continue*, Bellona Europa, 2015: http://network.bellona.org/content/uploads/sites/3/2015/11/Bellona-EV-Brief_The-Emission-Testing-Gap.pdf

[12] Directive 2009/33/EC on the Promotion of Clean and Energy-Efficient Road Transport Vehicles: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32009L0033

Boosting consumer confidence via fast-charging and smart-charging

EVs' limited driving range continues to act as a key disincentive to EV purchase. Attaining a driving range of roughly 400-500km is key to enabling inter-urban mobility and rendering EVs a viable alternative to ICE cars. Fortunately, studies predict that the cost of lithium-ion batteries will continue to decrease significantly over the next decade. Element Energy, for instance, finds that their packaging costs can be reduced up to 70% by 2030, to approximately €203/kWh from the current €661/kWh[13]. The graph below, on the other hand, illustrates the IEA's findings concerning cost reductions. It predicts that by 2020, EV battery costs will have reached $300kWh (or €283/kWh): a threshold they estimate to render EVs cost-competitive with their ICE counterparts[14].

Figure 16. Estimated Costs of EV Batteries through 2020
Source: IEA, U.S. DOE, Deutsche Bank.



In addition to their costs, we need to see further battery improvements to prolong their lifespan, allow them to charge faster, be lighter and safer, more technically reliable and easily recyclable. To this end, it is important for increased levels of EU funding to be made available and to stimulate specifically locally-manufactured batteries. Currently, it is Asian manufacturers that are dominating Li-ion battery production. This not only harms the EU's competitive advantage, but also entails high transportation costs, and most importantly a large carbon footprint. In order to ensure the CO_2 emissions entailed in transportation do not undermine the effect of electrification, it is important for the EU to invest in locally manufactured batteries. Inter-urban and international EV mobility will also depend on the construction of a truly interoperable EV re-charging infrastructure across Europe. While the Alternative Fuels Infrastructure (AFI) Directive aims to achieve this, it is important to ensure that its implementation does not hinder the introduction of improved, higher capacity batteries and faster re-charging connector rates. Fast-charging stations should be established at strategic spots. Here it is important to note that 90% of EVs are re-charged at home or at the work place. An effective way to ensure this is by including demands for EV charging in building regulations. The EU should look to California who has overcome similar barriers through its recent adoption of Assembly Bill 2565[15]. The bill aims to address barriers to deploying stations in rented buildings, thus bringing access to charging to more than 40% of Californians who live in multifamily housing. Last but not least, to exploit the full potential of EVs, policies should be put into places which induce EV smart charging. Smart charging will not only benefit EV owners in reducing their electricity bills, but will also contribute to optimising the uptake of renewables and improving the predictability of the grid. Bellona encourages Member States to incorporate smart charging into their National Plans, mandated by the AFI directive, as well as in their urban mobility policies.

Policies' effectiveness will depend on public awareness

While the introduction of the above listed policies and incentives 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 has shown that consumer awareness campaigns and local initiatives have been key in informing the public of the various environmental and economic benefits the purchase of an EV may offer.

[13] *EUROBAT E-mobility Battery R&D Roadmap 2030, Battery Technology for Vehicle Applications*, EUROBAT, 2015: http://www.eurobat.org/sites/default/files/eurobat_emobility_roadmap_lores_2.pdf

[14] *Global EV Outlook- Understanding the EV Landscape to 2020*, IEA, 2013: https://www.iea.org/publications/globalevoutlook_2013.pdf

[15] Assembly Bill No. 2565, 2014: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2565

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