

Attaining an interoperable EV recharging infrastructure in Europe

Barriers, opportunities, and making the shift from concept to reality

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2016 – A momentous year for the development of EV infrastructure

The past year has been important in terms of putting the transport sector in the spotlight, by unmasking the commonplace nature of car makers' fraudulent emission testing practices and by bringing an increasing number of actors in agreement over the need to transition to electric transport¹.

2016 looks promising for building on this momentum, with a number of upcoming opportunities to highlight and accelerate the wider uptake of electric vehicles (EVs). In the second quarter of 2016, for instance, the European Commission is expected to present a proposal for a post-2020 Effort Sharing Decision (ESD), which will be accompanied by a Communication on the Decarbonisation of Transport. Furthermore, 2016 will be a decisive year in terms of EU Member States' preparatory

process for the implementation of the Alternative Fuels Infrastructure (AFI) directive. In fact, by November 2016, Member States will have to have submitted their so-called National Policy Frameworks (NPFs), outlining how they aim to go about the directive's transposition.



An interoperable EV recharging infrastructure is key for attaining an EU Single Market for electro-mobility

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The months leading up to November will therefore be crucial for creating a common understanding, among Member States as well as EU policy makers, of how best to implement the

¹ Paris Declaration on Electro-mobility and Climate Change and Call to Action (December 2015), <http://newsroom.unfccc.int/lpaa/transport/the-paris-declaration-on-electro-mobility-and-climate-change-and-call-to-action/>

directive and how to overcome technical and non-technical barriers to interoperability. If left unrectified, these could have negative consequences for the wider uptake of electro-mobility, by damaging investor confidence in the technology and burdening EV users with higher costs as a result of market fragmentation and the prevalence of proprietary solutions.

This brief, therefore, provides a number of recommendations for the interpretation of the AFI directive so as to ensure its uniform implementation across EU countries. By drawing on best practices and lessons learnt from the Norwegian EV success story, this brief also shares Bellona's recommendations for overcoming interoperability issues central to electro-mobility, namely: standard- and fast-charging infrastructure, and the potential synergies with electric infrastructure already in place for public transport; smart charging; electricity roaming; payment solutions; and parking schemes.

What the AFI directive mandates and how to maximise its impact on electro-mobility uptake?

The AFI directive aims to address consumer anxieties by mandating the build-up of sufficient numbers of publically accessible stations and by setting EU-wide harmonised standards for charging infrastructure connectors as well as user information requirements. Many agree that the harmonisation of technology and standards is key for the mass rollout of EVs across Europe, which renders the AFI directive's implementation of crucial importance. Nevertheless, the directive fails to make clear whether the connector type requirement it sets, would apply to both private and publically accessible recharging points. The definition provided for "*publicly accessible recharging or refuelling point*" is "*a recharging or refuelling point which provides non-discriminatory access to the users*". This ambiguous wording could result in the AFI

directive being interpreted to impose the same technical specifications for every new-built re-charging point for EVs, irrespective of whether the infrastructure is private or public. In Germany for example, as observed in the country's proposed implementation text of the directive, any charger that can be physically accessed is considered a publically accessible charger, rendering even hotels and sport clubs (usually considered private locations) public chargers. **Bellona urges against such over-implementation of the directive, in order to avoid locking private infrastructure into an already outdated standard.**

A too narrow interpretation of the directive, i.e. equating public and private infrastructure by putting the same requirements for open access, risks creating barriers for private investors and hindering the development and introduction onto the market of more advanced (in terms of charging-speed) EV charging solutions. In this way, despite its intention to foster EV deployment, the AFI directive could unintentionally retard EV deployment.

In recognition of these unintentional but potentially harmful effects of a too narrow interpretation of the directive, Bellona calls for a clear distinction to be made between public and private infrastructure; with the latter remaining free to consider new, and more advanced EV charging solutions.

Bellona's recommendations for EV recharging infrastructure

Standard charging

According to latest statistics from EAFO, in 2015 out of a total of 72,043 charging stations across all of Europe 63,973 provided standard charging (up to 22kW)². Even in Norway, the country with the highest penetration of EVs per capita, 83% of

² European Alternative Fuels Observatory, <http://www.eafo.eu/electric-vehicle-charging-infrastructure>

the total EV infrastructure provides standard charging³. The majority of EV charging will therefore be in the form of standard- or semi-rapid charging done either at home or at the work place. Combined, these two secure an almost 24-hour-access to charging services for EV drivers. This calls for dedicated financial incentives to be put in place to support the deployment of private charging infrastructure in residential and office buildings, to reduce the often high initial costs. Moreover, the rights and procedures for private owners to install a charging point in existing shared apartment blocks should be simplified.

On the other hand, because the utilisation of public charging infrastructure will often be low, especially in initial phases, this may act as a disincentive for investors who face a longer payback time and challenges to achieve return of investment. Here too, public authorities will have an important role to play in supporting the roll-out of public charging infrastructure, including electric car-sharing schemes, during the initial semi-commercial phase through information provision and granting of subsidies.

Smart charging

While not imposing a legal obligation, the AFI directive calls on Member States to consider the use of intelligent metering systems and encourage flexible consumption and energy storage through dynamic pricing. As cars are normally parked for more than 90% of their lifetime⁴, this means EVs 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). EV smart charging reduces the total cost of ownership of a vehicle, leads to significant

CO₂ 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 renewable energies in the future⁵.

Policymakers, regulators and infrastructure operators can provide support by enforcing standards, setting up networks for smart charging, and providing EV drivers with the right incentives to use smart charging.

Rendering EVs a true substitute to internal combustion engine (ICE) cars depends on ensuring smooth inter-urban and inter-country EV mobility. In countries like Norway, this has already become a reality. Thanks to a concerted effort by the government to build out a nation-wide EV infrastructure, it is now possible to drive an EV from the South of Norway to the Russian border – a distance equivalent to driving from Oslo to Rome.

Fast-charging

In enabling EVs to refill their batteries within minutes as opposed to hours, fast-charging has been crucial for rectifying the perception of EVs as constrained to the urban environment. Unsurprisingly, in recent years most countries have seen support schemes being re-focused on the build-up of fast charging stations. The establishment of fast-charging points will be most needed along major European transport corridors, where demand is highest, in order to enable seamless commuting and inter-city travel. Strategic location for fast-charging stations is also crucial for fostering the business case for their deployment. A profitable scenario requires stations to be highly frequented, so that usage time is short enough to allow for many charging events per day. Avoiding over-implementation of

³ Open Charge Map, <http://openchargemap.org/site/>

⁴ <http://www.reinventingparking.org/2013/02/cars-are-parked-95-of-time-lets-check.html>

⁵ *Where will the energy storage mega trend lead us?* (December, 2015), Bellona Europa, <http://bellona.org/publication/where-will-the-energy-storage-mega-trend-lead-us>

the AFI directive is particularly important when it comes to fast charging infrastructure. A multi-standard solution at private fast-charging stations will avoid locking us into the single standard mandated by the AFI directive, namely Type “Combo2” or “CCS”, thereby encouraging innovation and introduction on the market of faster charging solutions. The need for this becomes ever more apparent given the current pace of technological development, and rapid improvements with regards to battery cost and capacity. Unsurprisingly, a number of car makers are already planning for the market introduction of more powerful chargers, solutions for more rapid charging, and larger battery capacities with longer driving ranges. These technological advances are making electro-mobility more attractive and useful to European citizens. **Allowing for non-standardised private charging solutions would avoid the need for premature revision of mandated standards as well as unnecessary investments for retrofitting of immediately obsolete stations** (the first revision of the standards mandated by the directive is envisaged to take place in 2020). A multi-charger solution approach to transposing the AFI directive, as observed in Norway, would make possible the co-existence of a number of different charging standards at private locations and allow for a natural market selection to take place, thereby encouraging further technological innovation. What is more, given that 70% of EVs in Europe are CHAdeMO users for fast-charging, a real business case exists for capturing CHAdeMO users, rather than prohibiting them from the market.

Exploiting synergies with existing electric infrastructure for public transport

As mentioned above, the building up of fast-charging stations will be most important along major European corridors. When it comes to fast charging stations in cities, however, Bellona calls for solutions which prioritise connections to

electric infrastructure already in place for public (and private) transportation, namely trams, car renting EV schemes, and e-bikes, which thus enhance inter-modality. This would help to reduce the need for civil works for new grid connections as well as the associated costs. Another way of reducing the substantial investments entailed in the provision of charging infrastructure would be through the possibility for Public Transport Authorities and Public Transport Operators 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. **Currently there is no legal clarity as to whether the Public Transport Authorities and Public Transport Operators are able to sell energy on their own.**

Such public-private transport synergies should go beyond the physical charging infrastructure. In Berlin, for example, to address interoperability issues it was decided that Radio Frequency Identification (RFID) cards would be the required minimal authentication system since they have already been put in place for other transport modes (bikes, public transport). Similarly, in order to motivate commuters to use EVs as part of commuting and other inter-city journeys, an EV for sharing was deposited at a train station near Copenhagen/Malmö area. For easy access the EV was equipped with a reader that accepts the travel card already widely used for authentication at public transport. Therefore it is one card for all, permitting a seamless perception of mobility.⁶

Interoperability goes beyond the physical charging infrastructure

Payment solutions

Sustainable and standardised payment, access options and services across Europe are needed for

⁶ Green eMotion Final Report, http://www.greenemotion-project.eu/upload/pdf/deliverables/D11_8-Final-publishable-summary-report-V1_4.pdf

the EV market to take off. 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). Bellona calls for an appropriate balance between pay-as-you-go solutions and roaming contracts when it comes to payment schemes for EV charging. **Observed use patterns and charging behaviour in Member States are important determinants for the type of payment method that will be deemed most suitable.** In Norway, for instance, a recent survey reveals that 95% of respondents can charge their EV at home during the night, and 59% have access to charging where they work. Since overnight charging at home has been the most common and convenient way of EV charging, preference has been shown for contract-based payment solutions, granting EV users more favourable and predictable tariffs. What is more, subscription-based payment solutions may be necessary in initial stages to foster the business case for investment-intensive fast-charging infrastructure by securing a stable income to operators via customer subscription. **When it comes to public charging infrastructure, however, excessive requirements for payment methods should be avoided.** Pay-as-you-go solutions should be made available at public charging infrastructure. Imposing proprietary subscription-based payment requirements can create interoperability barriers in particular when it comes to inter-city and inter-country EV mobility, and unintentionally act to hamper overall electro-mobility uptake. In recognition of this, Norway's state-owned agency, Enova, makes its funding to public recharging infrastructure conditional on its provision of pay-as-you-go payment solutions.

In addition to predictability when it comes to payment methods, **EV charging services need to be affordable, reasonable and proportionately priced compared to the overall cost level in**

each Member State. Currently, however, this is not the case, with the price charged for fast-charging an EV today ranging from EUR 0 to EUR 13/half hour across Europe.



41% of EV users in Norway have quoted 'cost saving' as the primary reason for EV purchase

Photo Credit: Thinkstock Photos

Electricity roaming

An interoperable electro-mobility service market in Europe requires a roaming system that can be established between charging point operators, but which also allows electricity roaming, i.e. allowing customers to freely choose a (renewable) energy supplier. 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. As is the situation for service providers in the mobile phone industry today, electricity roaming provides the opportunity for consumers to easily change their preferred energy supplier; incentivising suppliers to provide high quality services, and offer options for sourcing environmentally clean energy. In addition, consumers are able to achieve the same quality of

service in any place they charge in a seamless way. In some countries, one issue related to the need to switching energy supplier at the charging station is that only suppliers with a license issued in the country [where customers 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.

Parking schemes

Putting intelligent parking schemes in place is essential for ensuring that existing charging stations are optimally used and misuse prevented. EV parking slots have been heavily misused in many cities across Europe, by fully-charged EVs as well as ICE cars. In the case of Berlin, for example, parking schemes have until recently been based on initial energy use and charging compatibility only, which has meant that once fully charged EVs could stay parked for days or even weeks without having to pay. In order to rectify this, as of July 2016 all public charging infrastructure parking schemes in Berlin will have to put in place a time-based tariff system. Alternatively, Bellona advocates for pricing incentives to be put in place in order to stimulate correct parking behaviour, e.g. parking based on progressively increasing tariff. In addition, the establishment of an EU-wide charging station database and mobile tools capable of providing real time updates on EV parking and charging availability (e.g. Nobil in Norway) would further help in minimising time spent looking for parking and charging, as well as excessive queuing at fast-charging stations.

In sum, Bellona urges EU Member States to consider in their NPFs:

- 1) Ensure an open and timely implementation of the AFI directive, with a clear distinction between public and private infrastructure;
- 2) Equip or retrofit new buildings and parking lots with EV charging facilities to accommodate predominance of standard charging at home or at the workplace;
- 3) Incentivise EV smart charging to provide flexibility services to the electricity system while cutting consumers' electricity bills;
- 4) Establish fast-charging points where demand is highest, along major European transport corridors in order to enable seamless inter-city travel;
- 5) Allow for the co-existence of a number of different fast-charging standards so as to allow for a natural market selection to take place, thereby encouraging further technological innovation;
- 6) The establishment of public fast charging points in cities should prioritise connections to electric infrastructure already in place for public (and private) transportation, thus enhancing inter-modality and reducing infrastructure cost;
- 7) Subscription-based payment solutions may be necessary initially to foster the business case for investment-intensive fast-charging infrastructure by securing a stable income to operators via customer subscription;
- 8) Pay-as-you-go solutions should be made available at public charging infrastructure, and proprietary subscription-based payment requirements avoided;
- 9) EV charging services need to be affordable, reasonable and proportionately priced compared to the overall cost level in each Member State;
- 10) Allow for electricity roaming, thereby making it possible to easily change preferred energy supplier; incentivising suppliers to provide high quality services;
- 11) Put in place intelligent parking schemes to ensure that existing charging stations are optimally used and misuse prevented, e.g. use time-based tariffs or fiscal incentives to stimulate correct parking behaviour.

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