



**smartEn**  
Smart Energy Europe

## smartEn White Paper

Making electric vehicles integral parts of the power system

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## About smartEn - Smart Energy Europe

**smartEn is the European business association for digital and decentralised energy solutions.** Our members include innovators in services and technology for energy and data management, finance and research. By taking an integrated perspective on the interaction of demand and supply, we promote system efficiency, encourage innovation and diversity, empower energy consumers and drive the decarbonisation of the energy sector.

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*The positions expressed in this document represent the views of smartEn as an association, but not necessarily the opinion of each specific smartEn member*

## WHITE PAPER

# Making electric vehicles integral parts of the power system

## Introduction

Electric vehicles (EVs) were not developed for the power sector as a grid flexibility solution. Their primary purpose is to serve mobility needs. However, an integrated perspective on the interaction between transport and energy is required to drive the decarbonisation of the transport sector, to ensure the best energy system efficiency, to leverage their contribution to the decarbonisation of electricity and to empower consumers.

To pave the way for this change, smartEn has identified in the present White Paper **5 key top priorities that must be addressed to drive the uptake of e-mobility and to ensure that EVs are fully integrated in the energy system:**

1. Make it easy for EVs to interact with the electricity grid to reveal the value and benefits of their flexibility
2. Eliminate barriers to the aggregation of EVs
3. Support reduction of cost of equipment/installation and increased availability of smart charging infrastructure
4. Harmonise across the EU to simplify the user experience
5. Revise the taxation system taking into account the fewer negative externalities and increased social benefits of e-mobility

For each top priority, specific recommendations are identified and addressed to:

- the European Commission for the revisions of the Alternative Fuel Infrastructure Directive, the Energy Taxation Directive and the State aid Guidelines as well to inspire the EU 2019-2024 Strategic Agenda on e-mobility;
- Member States to encourage ambitious implementation of some EU legislations, notably the Electricity Directive and the revised Energy Performance of Buildings Directive.

## Background

The EU Long-Term Climate Strategy of the European Commission shows how **Europe can lead the way to a climate neutral economy by 2050**.<sup>1</sup> All sectors must contribute and **the transport sector has a significant role to play**. The latest State of the Energy Union<sup>2</sup> suggests the sector is still lagging behind:

- since 1990, emissions have decreased in all economic sectors *except* transport: energy consumption and emissions decreased between 2007 and 2013, but are now roughly back at 2005 levels. Transport is responsible for 30% of CO<sub>2</sub> emissions in Europe;
- the penetration of renewable energy varies across sectors, with only 7.6% in the transport sector (while reaching 30.8% in the electricity sector and 19.5% in the heating and cooling sector).

However, the promotion of low- and zero-emission vehicles running on alternative fuels is a key part of a system approach to the decarbonisation of mobility. Although at an early stage, the current EU market of alternative fuels and related infrastructure sees a large prominence of liquefied petroleum gas (LPG), but as outlined in all European Commission's pathways to climate neutrality, **the electrification of mobility stands as the most promising solution to decarbonise transport**.

Currently in Europe, the development of electro-mobility is still far from becoming the norm. The market penetration of EVs has been slow on the uptake, making up only 2.2% of new sales today, with around 1 million passenger EVs across the EU having registered by the end of 2018<sup>3</sup>.

**Tackling the right challenges and setting a clear vision for the development of e-mobility would accelerate EVs adoption.** Already now, some Member States and several regional and local authorities have adopted or are planning to adopt ambitious strategies and policies to foster the decarbonisation of mobility and transport,

<sup>1</sup> European Commission, "A Clean Planet for all", COM (2018) 773 final

<sup>2</sup> European Commission, "Fourth report on the State of the Energy Union", COM (2019) 175 final

<sup>3</sup> Information based on the European Alternative Fuels Observatory database [www.eafo.eu](http://www.eafo.eu)

including plans to stop the sale of internal combustion engine (ICE) vehicles (e.g. the Netherlands, Denmark and Ireland in 2030, followed by France and the UK in 2040).<sup>4</sup>

These strategies and targeted policies should ensure that the market penetration of EVs will reach +30%/year between 2020 and 2030, when EVs could account for 9% of the European fleet<sup>5</sup> and reach 63% of new car sales in 2040<sup>6</sup>. European carmakers have already jointly committed more than €130 billion to electrification in the coming years.<sup>7</sup>

Deep transport decarbonisation will also produce new employment opportunities. Nearly 200,000 jobs will be created in the electricity sector by 2030 as a result of a shift to electric cars - more than twice the number that could be lost in car manufacturing.<sup>8</sup>

Furthermore, e-mobility contributes to innovation, creating new business models and new opportunities for the auto industry, charging manufacturers and service providers.

**The development of e-mobility is not just about increasing the number of EVs on our streets.**

**It requires public and private smart charging infrastructure to be deployed across Europe.**

**Charging EVs entails both challenges and opportunities for the entire electricity system.** The key is to accompany the expansion of EVs with smart charging infrastructure that can adapt the final user's electricity demand for charging EVs to avoid network congestion, maximise use of clean electricity and reduce charging costs (V1G).

It should also be possible for smart charging infrastructure to enable the development of vehicle-to-grid services<sup>9</sup> to:

- allow EV batteries to have bi-directional capabilities, i.e. be charged and discharged for grid purposes like balancing supply and demand, or providing ancillary and flexibility services with Vehicle-to-Grid schemes (V2G);
- let EV provide backup electricity, e.g. for when electricity prices rise during peak hours to allow for Vehicle-to-Home (V2H), or for energy positive buildings to shift locally produced electricity so it can be used at times when it is needed with Vehicle-to-Building (V2B).

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<sup>4</sup> Evaluation Roadmap of the Directive on the Deployment of Alternative Fuels Infrastructure Ref. Ares (2019)1061582 - 20/02/2019

<sup>5</sup> Accenture, "Flex and Balances – Unlocking value from flexibility in the European power system", 2018

<sup>6</sup> BNEF, "Long term electric vehicle outlook 2018", 2017

<sup>7</sup> <https://graphics.reuters.com/AUTOS-INVESTMENT-ELECTRIC/010081ZB3HD/index.html>

<sup>8</sup> European Association of Electrical Contractors (AIE), "Powering a new value chain in the automotive sector – the job potential of transport electrification", November 2018

<sup>9</sup> To enable bi-directional services, it is also necessary to have vehicles that are capable of both charging and discharging. At the moment, only a few automakers offer on the market such vehicles.

## 1. MAKE IT EASY FOR ELECTRIC VEHICLES TO INTERACT WITH THE ELECTRICITY SYSTEM TO REVEAL THE VALUE AND BENEFIT OF THEIR FLEXIBILITY

The EU aims at bringing about 40 million EVs on European roads by 2030.<sup>10</sup> This development entails both challenges and opportunities for the entire electricity system. If not managed properly, a massive uptake of EVs may strain the grid and require substantial (and costly) grid reinforcements. Conversely the coming influx of EVs could potentially become, in aggregate, a new decentralised energy resource (DER) which could provide services to both system level and locally, and be remunerated for that. This requires a smart charging infrastructure that enables EVs to become true grid assets.

To ease this interaction with the electricity grid, the following three priorities should be targeted:

### a) No asset class for EVs

Batteries in EVs are a type of energy storage system and can perform as a DER.

Comparable to stationary storage devices, EVs can provide a wide range of services to the grid both as consumer and producer. With the development of e-mobility, EVs will ultimately gain prominence as a grid resource, indistinguishable from other DERs – at a global level, it is expected that in 2050 around 14 TWh of EV batteries would be available to provide grid services, compared to 9 TWh of stationary batteries.<sup>11</sup>

Because EVs can provide a wide range of grid services, they should not be assigned to a specific asset class. Under the current electricity market design and network codes, EVs are an excellent case of a resource that would be undervalued and under-utilised if restricted to a specific asset definition.

#### Recommendation

When defining network codes, the Commission and competent bodies such as ENTSO-E should value EVs as service providers and not classify them into a specific asset class. According to a service-based approach, the needs of DSOs and TSOs are defined in certain products/services and the technologies that provide them should not be specified. This technology-neutral approach should be applied to all DERs and specifically for the interaction of EVs with DSOs.

#### Example

*In the UK, EVs flexibility can be offered to DSOs on the Picloflex<sup>12</sup> platform as a source of local flexibility.*

### b) Access to in-vehicle-data for CPOs and EMSPs

As EVs should not be assigned to a specific asset class, a DSO requires minimal information on the EVs: it is not necessary to inform the DSO whether an individual has an EV and how he intends using it. Also, access by DSOs to in-vehicle-data, such as the battery's state of charge, is not needed to enable smart charging and V2G services for grid stability.

On the contrary, the access by market actors like charge point operators (CPOs) or electro-mobility service providers (EMSPs) to in-vehicle-data is quite essential to enable smart charging and V2G services. Market actors that are authorized by the relevant consumer should be able to instantly gain information like the state of charge or the planned departure time of the consumer. With this information it is possible to adapt the charging process to realize flexibility, respecting the given restrictions like a limited grid capacity connection or a time frame during which the car is connected to the charging point.

#### Recommendation

When implementing provisions related to data management in the Electricity Directive, Member States should specify they apply also to data of EVs to enable eligible parties as CPOs and EMSPs to access relevant in-vehicle-data from their customers.

#### Example

*An upcoming French law on mobility (Loi Orientation Mobilités) sets the obligation to provide non-discriminatory access to vehicle data relevant to the development of vehicle-related services, services based on fleet management, alternative fuel distribution services and innovative mobility services attached to the vehicle.*

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<sup>10</sup> Eurelectric/McKinsey calculation based on the recently agreed CO2 standards, Clean Vehicles Directive and a Commission non-paper ([https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/non\\_paper\\_co2\\_proposal\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/non_paper_co2_proposal_en.pdf))

<sup>11</sup> IRENA, 2019

<sup>12</sup> <https://picloflex.com/>

### c) Simplified interconnection process with the grid

Compared to other DERs, the interconnection process of charging infrastructure for EVs is more complex:

- in some Member States, there is only one licensed company to perform the interconnection process, creating a bottleneck, besides limiting competition;
- technical requirements for interconnecting devices are highly variable across Europe;
- the interconnection process is often slow, delaying installations and, therefore, delaying the market for EVs.

#### Recommendation

Member States should ensure that rules governing the interconnection process are jointly defined by the Ministries of transport and energy.

Any EU framework on the interconnection must make the process as simple and streamlined as possible, based on the certification provided by the charging manufacturer.

Technical standards for charger installations should be promoted in order to increase competition between charging providers and reduce the cost and complexity of interconnection.

Technical requirements for interconnection should not lead to the duplication of equipment, which could be co-utilized at the grid tie (e.g. sharing of anti-islanding, metering and measuring devices at grid connection point, instead of requiring that each DER behind the meter has its own).

#### Example

*The grid interconnection in Germany is required just for charging infrastructures with a capacity above 135 kW. It is based on certifications provided by the charging manufacturer.*

*In France, a law currently in development (Loi Orientation Mobilités) foresees that the DSOs can take up to 75% of the grid connection cost of EV charging infrastructure until 2021 (with inclusion in its regulated asset base and electricity price).<sup>13</sup>*

### d) No double network charges

The Electricity Directive laid down the principles of cost-reflective network charges and no double network charges for active customers owning an energy storage facility. EVs' batteries are a type of energy storage and a DER that can bring additional flexibility to the electricity system, thus optimizing vehicles' charging patterns and grid integration, and also support the integration of renewable energy.

#### Recommendation

When implementing article 15.5 of the Electricity Directive, Member States should ensure that EV batteries are treated on a level playing field with other technologies and, in the same way as static energy storage facilities, are not subject to double network charges. This includes network charges on electricity not used, but fed back into the grid in order to support it.

## 2. ELIMINATE BARRIERS TO THE AGGREGATION OF ELECTRIC VEHICLES

EVs are valuable flexibility resources and aggregator business models facilitate the use of EVs as a source of flexibility. When EVs are aggregated they can complement one other, resulting in a virtual power plant with the ability to provide services for the needed period of time.

In a hypothetical scenario of full electrification at current conditions, activation of just 1% of the total installed capacity of EVs (1770 GW) would give a flexibility of around 18 GW.<sup>14</sup>

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<sup>13</sup> Loi LOM article 23 « pour les demandes de raccordement adressées au maître d'ouvrage concerné entre la publication de la présente loi et le 31 décembre 2021, le maximum de la prise en charge est fixé à 75 % pour le raccordement aux réseaux publics de distribution d'électricité des infrastructures de recharge de véhicules électriques et hybrides rechargeables ouvertes au public. Le niveau de la prise en charge est arrêté par l'autorité administrative après avis de la Commission de régulation de l'énergie, en fonction des caractéristiques de l'infrastructure de recharge, notamment de son niveau de puissance, et du niveau de couverture par les infrastructures de recharge existantes» - [www.senat.fr/petite-loi-ameli/2018-2019/369.html](http://www.senat.fr/petite-loi-ameli/2018-2019/369.html)

<sup>14</sup> EDF calculations 2018

The flexible use of EVs happens when they are parked - on average 90% of the time, when only 10% of that time is used for actual charging.<sup>15</sup>

### Recommendation

When implementing the Electricity Directive, Member States and regulatory bodies should ensure that:

- there is no discrimination between aggregated and non-aggregated EVs;
- EVs can be aggregated with other types of assets in mixed pools. These pools of mixed assets, including EVs, should be on an equal footing with any other flexibility resource on the grid and in energy markets;
- Aggregators should be allowed to pool the flexibility of EVs charging in both buildings and public infrastructures. Legislation should not limit the possibility to aggregate EVs only behind the meter and the house connection, as currently in discussion in Germany;
- companies are incentivised to aggregate the flexibility of EVs parked on their sites, whether from their fleet, their employees, visitors or customers. These companies should be able to share the revenues with the EV owners, without considering them as an extra source of income or employee benefits.

### 3. SUPPORT REDUCTION OF COST OF EQUIPMENT/INSTALLATION AND INCREASED AVAILABILITY OF SMART CHARGING INFRASTRUCTURE

Policymakers should consider costs in the e-mobility sector from a holistic perspective. The total cost of ownership of an EV and the charging infrastructure can be lowered by enabling EVs to provide valuable energy services. Any incentive set by policymakers to facilitate these services, such as smart charging or the supply of grid ancillary services, will help consumers obtain revenues with their EVs to offset costs, reduce the total cost of ownership and thus accelerate their market penetration<sup>16</sup>. The entire energy system will also benefit, and (grid reinforcement) costs will be reduced.

A recent study on costs and benefits in 4 different Member States (France, Italy, Spain, and the UK) showed that the net benefit would be between ~€0.5 and €1.3 billion per year, depending on the country, even after incorporating the costs associated with additional smart charging infrastructure<sup>17</sup>.

For the active integration and interaction of EVs with the system, the establishment of a reliable (public and private) EV charging network is crucial.

In order to service a growing deployment of EVs, charging infrastructures will need to keep pace. In 2018, there were about 155,000 public and 120,000 private<sup>18</sup> electric charging points across Europe. Cumulative investments in both public and private charges will need to reach €25 billion to support an EV deployment pathway in Europe that is broadly compatible with the (unambitious) 2 degree's scenario.<sup>19</sup>

At the time of this writing, at least 18 out of 28 Member States offer support measures for EV charging infrastructure. While fiscal incentives prove effective to kickstart markets, direct subsidies to users and on-demand installation of public charging points are observed in more mature markets.<sup>20</sup>

The main reasons for the high cost of equipment and installation of infrastructure are the lack of economies of scale, lack of experience and lack of standardization. This is mainly a transitional issue that will be solved as the markets are established and solid business models drive down costs.

Their development is affected by the characteristics of some building types, the availability of public infrastructure and the status of the electricity grid.

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<sup>15</sup> Langton, A., & Crisostomo, N. (2013, October). Vehicle-Grid Integration: A Vision for Zero-Emission Transportation Interconnected throughout California's Electricity System. California Public Utilities Commission, Energy Division

<sup>16</sup> The study "Enjeux du développement de l'électromobilité pour le système électrique" by RTE and Avere-France (May 2019) affirms that in 2035 drivers will reduce their fuel budget x3 thanks to EVs and x5 if using smart charging. For example, a French citizen driving an EV for 14.000-15.300 km/year would spend Euro 365-400/year without smart charging, and would further cut this cost of around Euro 60-170 with V1G and an additional Euro 100 for V2G.

<sup>17</sup> [www.transportenvironment.org/sites/te/files/publications/2019\\_06\\_Batteries\\_on\\_wheels\\_TE\\_briefing.pdf](http://www.transportenvironment.org/sites/te/files/publications/2019_06_Batteries_on_wheels_TE_briefing.pdf)

<sup>18</sup> EAFO, 2018

<sup>19</sup> Harrison P, "Fuelling Europe's Future: How the transition from oil strengthens the economy", 2018

<sup>20</sup> Eurelectric survey 2019



### a) Ensure only smart charging infrastructures are deployed in buildings

In the short to mid-term, about 20% of kWh will be charged at public sites in and between cities, while 80% of kWh will be charged at private sites (at home or at work)<sup>21</sup>, mostly in buildings where normal-power smart charging points (between 3,7 and 22 kW) will be enough.

The revised EPBD sets only minimum requirements for the installation of charging points and ducting infrastructures for certain types of new buildings and in case of major renovations. However, charging EVs without smart chargers would simply put an additional burden to the individual building's energy load and to the grid at large.

EV can also provide services behind the meter at customer site and this should be fostered through smart charging in buildings.

#### Recommendation

When shaping the national long-term renovation strategies and the building codes to implement the EPBD review, Member States should define policies that foster only the deployment of smart charging infrastructures, for both V1G and V2X. This should apply for all new buildings and also for renovations that are not considered to be major ones.

#### Example

*In United Kingdom, from July 2019, only home charge points that use "smart" technology will be eligible for government funding under the Electric Vehicle Homecharge Scheme.*

### b) Special incentives for smart charging infrastructures in multi-family and shared buildings

As 42% of the EU population lives in multi-family buildings and as most offices are located in shared commercial buildings, there is a strong need to offer EV charging for these building types.

The revised Energy Performance of Buildings Directive (EPBD) failed to address the specific challenges of multi-family and shared buildings when it comes to charging infrastructures.

If each occupant installs an individual and expensive charging solution, it would be more expensive and would increase the load consumption of the building, unless properly planned.

#### Recommendation

For multi-family and shared buildings, the "right to plug" should be enshrined in national laws to overcome administrative barriers to the deployment of smart charging infrastructure. Centralized smart charging for common use by building residents should be favoured over the individual installation of chargers in different moments.

This cost-efficient option, however, require a higher capex investment, which is unfair for building occupants that do not own an EV.

In light of the implementation of the revised EPBD, Member States should be able to grant special incentives to support the installation of centralized smart chargers for these types of buildings. This is justified by the market failure that the higher investment costs for such centralized chargers would otherwise entail. Also, such special incentives should remove the disadvantage of first movers and stimulate the adoption of EVs by other occupants, as the cost of additional chargers in a common parking lot are often marginal after initial grid connection.

The revision of the State aid for Environmental Protection and Energy should also allow targeted subsidies at an earlier stage of this market to help decrease costs, while increasing experience and economies of scale for end users.

The cost of subsidies will be largely offset by the increased social welfare of increased EV penetration and grid reinforcement deferral.

Beyond these special incentives to support centralized smart charging infrastructure, other financing options should be encouraged, e.g. energy suppliers to cover the costs of installation and require that only users pay a flat fee against an exclusivity right for 5 years.

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<sup>21</sup> ChargePoint, September 2018



### Examples

*Sacramento Municipal Utility District in California offers rebates to multi-family buildings installing chargers, up to \$1,500 for up to 20 normal EV charging stations or up to \$100,000 for fast EV charging stations.<sup>22</sup>*

*In France, suppliers must finance energy efficiency certificates that support the Advenir program which subsidises the installation of charging points in multi-dwelling units.<sup>23</sup>*

### c) Targeted support for public infrastructure

The Alternative Fuel Infrastructure Directive (AFID) encourages the installation of one public charging point per estimated 10 EVs and at least every 60 km on the EU's Trans European Transport Network (TEN-T)<sup>24</sup>. In 2018, Europe's highways had 28 fast charging points per every 100 km.<sup>25</sup>

To have a reliable EV charging network, it is essential to deploy sufficient publicly accessible<sup>26</sup> charging points. In particular, for those drivers that cannot charge at home or at work, that do not have a garage or a driveway parking spot, public (overnight kerbside) charging infrastructure is vital.

For a charger to be truly accessible, an EV driver must be able, without hindrance, to do the following:

- drive to and park at the charger;
- plug the charger into their car;
- pay for the charging service.

### Recommendation

- The revised AFID should introduce a binding objective for publicly accessible smart infrastructure. When implementing it, Member States should take into account demographic criteria, traffic growth, vehicle sales and charging power profiles;
- Member States should implement the clear provisions recently set by the Electricity Directive for the development of public infrastructures: DSOs are not entitled to own, develop, manage or operate charging points, with the only temporary derogation in the case of market failure. This principle should apply also to any company that is legally connected to the DSO;
- The revision of the State aid Guidelines for Environmental Protection and Energy should allow local public authorities (e.g. towns and cities) to foster with public funding on-street charging infrastructure as a public good to help consumers that cannot charge at home or at work;
- Although innovative business models should be promoted and fostered, different EU funds, as the Connecting Europe Facility and European structural funds, should provide further support to finance public charging infrastructure integrated with the grid.

### Examples

*The city of Stockholm has identified specific "charge streets" where operators can easily reserve and build charging points.*

*The city of Amsterdam has introduced the "on demand" roll out of publicly accessible charging stations: users of EVs can request the municipality to install a public charging point if they do not own a private parking space and do not have access to a charging station within 300m from their home.*

*In France, smart charging capability is mandatory for charging stations<sup>27</sup> open to the public and some subsidies, as the Advenir Programme, are set to support this deployment.*

*Different innovative business models already exist to finance charging infrastructures through:*

- *V2G: Frederiksberg Forsyning, a utility in Denmark, offsets the cost of charging infrastructure to supply its own fleet thanks to the revenue from grid services (e.g. balancing);*

<sup>22</sup> [ww2.arb.ca.gov/](http://ww2.arb.ca.gov/)

<sup>23</sup> <http://advenir.mobi/>

<sup>24</sup> On these deployment recommendations, the AFID currently asks Member States to develop 'national targets and objectives' for the deployment of alternative fuels infrastructure, based on an assessment by the Member States of national, regional or Union-wide demand.

<sup>25</sup> EAFO data

<sup>26</sup> "Publicly accessible" is understood that everyone has non-discriminatory access to such infrastructure, irrespective of whether it is located on public or on private premises.

<sup>27</sup> <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000037248291&categorieLien=id>

- *advertisement: Analogy, an urban furniture provider, advertises its product on the charger, or puts ads in the app, and the revenues cover the cost of charging infrastructure;*
- *sharing with the general public: the charging infrastructure for city council fleets is also open to the general public.*

#### d) Apply open technical standards to prevent vendor lock-in for publicly funded infrastructure

Until now, some e-mobility providers have pursued proprietary technologies, in particular:

- some charging manufacturers are using a proprietary communications protocol between their chargers and their network software. When site owners purchase the chargers, they are locked into that vendor for the network services for the life of that charger;
- some charging networks have cables that can be used only for their own vehicles and not for those of other car manufacturers.

#### Recommendation

At least for any publicly funded infrastructure, open technical standards should be used to prevent vendor lock-in, increase customer choice and lower costs, boost interoperability and cybersecurity. This should apply for both cables and communications protocol between chargers and network software.

- While the cables standard for passenger vehicles has been solved by the existing AFID, it remains an issue for buses and large trucks, which should be addressed in the AFID revision.
- The AFID revision should also require charging manufacturers to comply with a standard communications protocol between chargers and network software, such as the Open Charge Point Protocol (OCPP)<sup>28</sup> or IEC63110, to ensure true interoperability, to allow EMSPs/CPOs to compete and offer different services, and avoid that just an EMSP/CPO is locked in. The site owner should be able to choose a new network provider if prices go up, service levels go down, or for any other reason preferred by the site owner.

Charging manufacturers should continuously compete for business rather than competing just once when the charger is sold and then locking the customer into the provider's solution for the next 10 years. Also, the risk of stranded assets is minimized, because if one network provider exits the business, another provider can come in and provide the service for the already installed charger.

#### e) Charging infrastructure investments affected by the status of the electricity grid

A proper system integration of EVs is a top priority to avoid investment in stranded assets and to reap their benefits for the energy system (e.g. higher renewable integration) and for the customer sites (e.g. smart charging infrastructure investment behind the meter can be used as a storage asset providing behind the meter flexibility). The deployment of charging infrastructure has grid costs and system benefits that vary significantly between Member States, as these investments are affected by:

- the share of electricity in their energy mix;
- the possibility for decentralised energy solutions to offer their demand-side flexibility.

In general terms, countries with a high electricity share in their energy mix and which also integrate different flexibility sources would incur lower costs compared to other Member States with infrastructure geared toward other energy sources and inflexible consumption patterns.

#### Recommendation

- To stimulate the development of clean electrification and demand-side flexibility, Member States should implement the Electricity Directive and the revised Renewables Directive in an ambitious way, as recently agreed at EU level;
- When implementing the Electricity Directive, EVs should be considered as a flexibility resource for the system. DSOs must be encouraged to systematically consider these flexibility capabilities as non-wire alternatives to their network reinforcement. This will facilitate EV rollout and avoid the need for more investment in grid development, which would in turn increase the costs for the overall system.

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<sup>28</sup> It was developed by the Open Charge Alliance, which is open to all industry participants.

### Examples

*In countries like Norway and France, which already have a well-developed electrical system, the (grid) infrastructure is much more robust and can more easily absorb a higher number of EVs connected to the grid.*

*In Norway, the cost-efficient grid integration of charging points is well calibrated and achieved through the use of a specific grid connection charge (Anleggsbidrag) that DSO can claim to cover the costs of connecting new customers to the grid or reinforcing it for existing customers demanding new capacity. The charge is to be paid to the DSO by the customer(s) triggering the investment. It can vary significantly as it reflects capacity constraints and aims at localising new charges where grid investment costs are lower. For example, the grid connection charge for fast-charging can vary between NOK 50,000 and 650,000 depending on location. The price signal has proved that the decision is influenced by location and size.<sup>29</sup>*

## 4. HARMONISE ACROSS THE EU TO SIMPLIFY THE USER EXPERIENCE

To facilitate ease of use, the wide uptake of EVs and to reveal the benefits of EVs for the energy system, it is essential to remove current barriers and harmonise some aspects across Europe that are currently hindering e-mobility:

### a) Non-discrimination between payment methods

In the electromobility market, two types of customer models have emerged: ad hoc and contract-based charging. While the ad hoc payment does not require a contract with the electricity supplier or operator concerned, the contract-based payment method does not end “on the spot”, i.e. when the charging transaction is terminated. The contract-based payment enables end-users to settle all recharging sessions in any given period (i.e. a month) in one bill sent by the e-mobility service provider (EMSP) to the customer at the end of that contractual period.

Now, there are barriers to ad hoc payment. Most of the time EV drivers must sign up separately, using a smart phone app and RFID card, for each charging network.

This is due to the absence of accompanying EU-wide protocols and standards for interoperability and e-roaming which is ultimately hindering the development of cross-border EV travel within the EU.<sup>30</sup>

Open payment standards ensure universal access to public chargers, reduce range anxiety, improve the user experience, and further promote EV adoption.

Another issue is data privacy. With the current proprietary payment systems, EV drivers must provide their confidential Personally Identifiable Information (PII) to the charging network provider to be able to use the public chargers – again, unlike gas stations, where people can simply swipe their credit card. However, it is not clear whether this requirement to disclose PII to charge an EV is allowed under the GDPR.

### Recommendation

The right of consumers to be able to charge on the spot should be maintained in the forthcoming revision of the AFID and article 4.9 should be properly enforced.

As well, the revised AFID should foresee that EV drivers are able to choose the payment method that fits with their personal choices. A non-discriminatory treatment should be ensured between the two payment methods: all recharging points accessible to the public need to offer ad hoc charging solutions and not just contract-based charging.

In particular, ad hoc payment should be through an open and universally accessible method that complies with GDPR, i.e. credit card readers, to make paying for public charging as easy as paying for gasoline or diesel.

### Example

*This non-discriminatory treatment on payment methods is already enshrined in French law (Décret n° 2017-26 Article 20), which foresees that any public charging point allows ad hoc payment and does not oblige end-users to have a contract or subscribe with a mobility operator or the operator of the infrastructure.<sup>31</sup>*

<sup>29</sup> RAP, “Start with Smart: Promising Practices for the EVs revolution”, 2019

<sup>30</sup> Advancing E-Roaming in Europe: Towards a Single “Language” for the European Charging Infrastructure, World Electric Vehicle Journal, 2018, 9, 50

<sup>31</sup> [www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033860620](http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033860620)

California has proposed a regulation that would require public chargers to have credit card readers to allow ad hoc payments.<sup>32</sup>

### b) Ensure price transparency for publicly accessible stations

The AFID already requires that prices charged by charge point operators (CPOs) are “reasonable, easily and clearly comparable, transparent and non-discriminatory”. However, there is currently great uncertainty for the consumer on how much to pay for charging an EV, especially when roaming. Consumers often do not know the exact price prior to their charge or are confronted with unexpected costs on their bill, e.g. time based or session fees.

#### Recommendation

The revised AFID needs to make charging tariffs transparent and comparable. In particular, the revised AFID should foresee that:

- by default, the metric used to set the tariff at a charging station is the amount of power to charge an EV. Both ad hoc and contract-based payment methods should provide a transparent price/kWh to end-users prior to charging;
- where necessary, the power-based tariffs (price/kWh) might be complemented with a time fee, the so-called minute charging (payment based on time spent for charging an EV). If minute charging is applied, for example when bundled with a parking service at a high-power charging point, the revised AFID should set minimum requirements on the quality of the service and set that both price/kWh and the price for the parking service are clearly highlighted to EV drivers prior to charging;
- offering charging for free should be possible, for example to reward charging occurring when there is abundance of clean renewables energy and/or the grid is not in stress;
- smart applications or websites for price comparison and potentially real-time pricing should be fostered for the benefit of end-users, which should also outline potential pricing adjustments in exchange for offering flexibility services;
- together with the price, the origin of energy (e.g. renewable or other) should be highlighted at the charging point station with clear indication of whether this is achieved through Guarantees of Origin or other means that certify the energy source at all times;
- travelling across the EU should not lead to extra charges, just as this was achieved with roaming for mobile telecommunication in 2015<sup>33</sup>.

### c) Always consider charge point operators as service providers

Providing EV charging is a service and not a supply of energy.

#### Recommendation

The revised AFID should enshrine the principle that CPO should always be considered as service providers across the EU and not energy suppliers. This would avoid the risk to impose CPOs additional requirements specifically related to suppliers.

No legal separation between CPO and EMSP should be introduced in the revised AFID. A clarification of the roles should be included, but not a limit for CPO and EMSP to offer multiple services.

#### Example

*In France the legal status of CPOs is being clarified by the Loi Orientation Mobilités (that modifies in its article 23 the Energy Code in its article 334-4): CPOs are not supplying energy, but services. This implies that CPOs are not subject to the licensing requirements of energy suppliers (and associated administrative burden and minimum*

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<sup>32</sup> Electric Vehicle Charging Stations Open Access (Senate Bill 454), Proposed Regulation Order, California Air Resources Board, May 2019 - [www.arb.ca.gov/regact/2019/evse2019/notice.pdf?\\_ga=2.258373641.245683960.1558638227-1204654842.1523298949](http://www.arb.ca.gov/regact/2019/evse2019/notice.pdf?_ga=2.258373641.245683960.1558638227-1204654842.1523298949)

<sup>33</sup> Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union

financial capacity requirements). They can bill this service by kWh without the risk of being qualified as energy suppliers.<sup>34</sup>

#### d) Minimum requirements for smart meters in smart charging infrastructure

Metering systems link the vehicle to the energy system.

Smart meters are energy devices, the source of energy data for efficient electricity demand management and accurate bills. Such data should be accessible and exchanged between different actors in the transport and electricity system. Imposing a separate and specific metering of EV charging in buildings creates a distinction between loads that would hinder optimisation of local energy resources, for example the maximisation of self-consumption, by creating useless complexity in metering, billing and invoicing of net energy use.

Provisions related to their roll-out and minimum functionalities are already outlined in the recently adopted Electricity Directive. Excessive requirements for smart meters can create barriers to their deployment and electrification of use, as in Germany due to the calibration law (“Eichrecht”).

Although smart meters are important assets for the electrification of the transport sector, other smart solutions can foster demand-side flexibility and any limiting requirement to alternative innovations should be avoided.

#### Recommendation

- No need to set new specific EU provisions for smart meters in charging infrastructure. In line with the implementation of the Electricity Directive, all Member States, including those that carried out a negative cost-benefit analysis for the deployment of smart meters, should enable the installation of smart meters in buildings where end-users request them;
- No separate meter for EV charging should be required for smart charging infrastructure installed on consumer sites. Also, no specific smart meter should be installed on EVs;
- In both private and public charging stations, smart meters should not be a limitation to provide smart charging services. Charging stations should be able to provide a wide range of services, as smart charging and also V2G/V2H, to avoid the deployment of stranded assets and obsolete infrastructure which cannot perform other services.

#### e) Common registration processes for EVs as service providers

In order to provide energy services, the registration process is a key first step. Harmonisation is needed across Europe for EVs. Market fragmentation from mixed requirements would create a burden not only on consumers driving across Europe, but also for automotive manufacturers that would need to create regional variations of their models, specific to each country, with less possibilities for economies of scale that could be passed on to their customers.

#### Recommendations

The registration process of an EV as an asset able to provide services should be as seamless and easy as possible to facilitate consumers to engage with the electricity system through their EVs.

It is unnecessary and counterproductive to require each individual vehicle to go through a different registration process. In this light, a specific EU regulatory framework should foresee that a specific car model should be directly registered at the factory or at the same time of the regular car registration. No additional steps should be required involving individual EV drivers directly.

A simple solution could be a “type certification” providing clear information on the certified flexibility capabilities of each EV car model which should detail the operational window in which it can provide flexibility (e.g. the limits to level and to power of charge/discharge, maximum number of activations, frequency, ...) and score its V1G/V2G capabilities. Such information should be transparent and accessible also to consumers, prior to purchase, akin to energy labelling for appliances or the Energy Performance Certificate for buildings.

Such harmonised, common EU registration framework should be limited to EVs and not extended to charging points whose capabilities should be asserted by their operators, be subject to a clear definition of what is a “smart” charge point and follow an EU harmonised grid interconnection process (as described in section 1.c).

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<sup>34</sup> Taxes and levies on energy consumption are paid by CPOs which have an electricity supply contract with a supplier. These charges are transferred to their clients through the price of the charging service.

## 5. REVISE THE TAXATION SYSTEM TAKING INTO ACCOUNT THE FEWER NEGATIVE EXTERNALITIES AND INCREASED SOCIAL BENEFITS OF E-MOBILITY

Motor vehicle taxation brings in €428 billion per year to governments in the EU-15 countries alone<sup>35</sup>.

As EV numbers increase, alternatives to fuel taxation as a source of revenue will have to be found. Since the negative externalities of ICE vehicles would be greatly reduced by e-mobility (i.e. less health cost, less congestion cost, less energy imports, ...), this would undermine the ground for taxation for EVs.

### a) Unconsumed electricity should not be taxed

In 2016, energy taxes collected by EU Member States amounted to €280 billion or 4.7% of total tax revenue. The relative importance of energy tax revenue has been rather stable since the 2008 economic crisis. Excise duties (of which more than 80% comes from oil products) constitute the largest part of energy taxes.<sup>36</sup>

When charging an EV, electricity can be used for driving, but also stored and fed back to provide grid services at a later moment (to alleviate the needs for further investment in grid expansion). This difference must be taken into account when setting electricity taxes.

In the current taxation frameworks, EV batteries are considered merely as consumption points – their ability to provide flexibility services by charging and discharging when the system needs it, is not taken into account. In fact, if EV batteries provide flexibility services, they are taxed when they withdraw electricity from the grid (downward flexibility) although this electricity will not be used but fed back later into the grid. This puts EV batteries' flexibility at a competitive disadvantage when providing flexibility.

#### Recommendation

The 2003 Energy Taxation Directive needs to be revised in view of supporting e-mobility while complementing the goals of the internal market, as well as EU social and environmental objectives.

The revised Energy Taxation Directive should set a clear tax exemption for electricity not consumed in the EV battery, but stored to provide grid services. If needed, methods should be designed to exempt from taxation the electricity that is not consumed, e.g. returned electricity to the grid from the battery of EVs.

On the other side, electricity consumed in EVs could be taxed the same as the rest of electricity used for other purposes, to avoid any distinction in usage or asset class. In fact, any difference in taxation would hinder development of DER, be unfair to those that cannot merge their energy flows behind their meter, or be an incentive to exploit loopholes.

### b) Tax inefficient and non-flexible vehicles

Electric mobility has many societal benefits. However, across Europe, vehicles are taxed as assets, independently if electric or not. The most common taxation scheme affecting vehicles is the VAT.

#### Recommendation

Although EVs are 5 to 6 times more energy efficient than the best combustion engines, the guiding principle of taxes targeting vehicles (both ICE and EVs) should be to further improve their efficiency.

By implementing art. 7 of the Energy Efficiency Directive, Member States should set a proportionate taxation scheme: the greater their efficiency, the lower their taxation.

As by 2021, every EV manufacturer is required to provide the full energy consumption of their vehicles - this data can be used for optimal taxation of EVs.

As an alternative, Member States should base taxes targeting vehicles on their flexibility (i.e. their ability to provide energy services) or CO2 footprint (i.e. a life-cycle approach from emissions since their manufacturing).

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<sup>35</sup> European Automobile Manufacturers' Association (ACEA), "Tax Guide", 24 April 2019 – Taxes considered in the report are related to vehicle acquisition (VAT, sales tax, registration tax), vehicle ownership (annual circulation tax, road tax) and motoring (fuel tax).

<sup>36</sup> European Commission, "Energy prices and costs in Europe", COM (2019)1 final