EV CHARGING: HOW TO TAP IN THE GRID SMARTLY?

The need for flexibility services for a sustainable deployment of electromobility and how to enhance them in the EU climate package

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With a market penetration of 10% in Europe in 2021[1], and with a purchase price and total cost of ownership outperforming that of the internal combustion engine (ICE) before the end of 2027[2], the take-up of electric vehicles (EVs) is expected to accelerate significantly in the coming years. The widespread electrification of transport is the most efficient way to reach Europe's climate objectives for the sector. Challenges may lie ahead, but smart charging must not be overlooked as the main asset for overcoming these hurdles.

A critical mass of EVs on the market will impact electricity consumption patterns and create an overall increase in electricity demand, particularly during peak-time periods. Smart charging can be a crucial tool for increasing the adoption rate of EVs, by mitigating the stress on the grid and supporting the transition towards sustainable electricity; each connected EV helps reduce CO2 emissions further. Smart charging can reduce CO2 by an estimated annual 600,000 tons by 2030, through the greater integration of renewables in the grid.[3]

With the electrification of usages, a rapid increase in decentralised and local loads could - if not managed correctly - overstretch the current low-voltage distribution grids, particularly in residential or commercial areas[4]; smart-charged EVs provide a solution. Bidirectional charging and other flexible services - where appropriate - can also provide solutions and benefits, both to the grid and to the end-user (of the grid and of the vehicles), and should not be overlooked.

The Platform for electromobility therefore welcomes that the 'Fit for 55' package recognises the importance of smart charging for integrating transport in the energy system but we encourage more robust and consistent support for smart charging throughout the package. In order to unlock all the benefits smart charging can deliver to the electricity system, to EV users, to the environment and to society at large, the following considerations should be respected in a coherent manner throughout all relevant legislative files.

1. What should be classified as smart charging?

[1] https://insideevs.com/news/564628/europe-plugin-car-sales-2021/#:~:text=Thanks%20to%20the%20strong%20second,in%20ten%20was%20all%2Delectric.
[2] https://www.transportenvironment.org/discover/evs-will-be-cheaper-than-petrol-cars-in-all-segments-by-2027-bnef-analysis-finds/
[3] Elia Group "Accelerating to net-zero: redefining energy and mobility"
[4] Smart charging: integrating a large widespread of electric cars in electricity distribution grids – EDSO, 2018

Definitions of smart charging differ between legislations. Indeed, different levels of 'smartness' are possible, depending on the business solution deployed and the level of involvement of the consumers. The Platform for electromobility believes that charging installation should be considered smart if:

a. it provides real-time adjustment
b. it adjusts charging in response to external signals
c. the adjustments give additional clear benefits to the EV driving consumers, providing flexibility to the grid.

Bidirectional charging comes to complement smart charging services. While unidirectional charging enables adjustment to the charging process depending on external signals, bidirectional charging – also known as V2X ('vehicle-to-everything') goes a step further. It allows the vehicle to exchange energy with the connected asset (grid, home, building) in both directions, as well as charging or discharging for as long as it is plugged in. This means that the vehicle can offer services for a longer timeframe, as unidirectional charging stops once the battery is full.

2. What are the benefits of smart and bidirectional charging?

Flexibility services are a vital enabler for grid management in the energy system of a carbon neutral Europe, and smart charging can play a crucial role in delivering this flexibility. New and refurbished charging installations (public and private) should therefore be smart.[5] The timeframe for a potential eventual retrofit of existing stations should be defined through a comprehensive impact assessment, coordinated with the stakeholders of all affected sectors and Member States. Such an impact assessment will allow a comprehensive overview of the requirements for retrofitting, and will therefore optimise both the cost and the deployment of smart charging points.

a. Smart charging will have a key role for the user in:
    - Empowering consumers in the energy transition, by transforming electric vehicles into an energy asset.
    - Taking full advantage of low electricity prices in the system for consumers and reduce the consumer's bill of electricity (savings are estimated between €60 and €170 per year[6]).
    - In the heavy-duty vehicle (HDV) segment such as e-buses, smart charger capability offers the possibility to optimise the charging process according to the e-bus's schedule, managing the allocation of the available power at charging depots (e.g. identifying and setting different priorities and criteria for charging the vehicle based, for example, on the order of arrival, departure-time priority, etc.).

b. Smart charging will have a key role for the grid in:
    - Increasing system efficiency, by integrating the road transport sector into the energy system. This will optimise the use of the electricity grid and reduce the investments required in the

[5] Exceptions such as underground parking lot, where Wi-Fi to is impossible may exist or through location management system.
[6] https://www.concerte.fr/system/files/concertation/Electromobilite%CC%81%20-%20Synth%C3%A8se%20vFinale.pdf

power grid (which could reach €375-€425 billion by 2030[7]) compared to those of unmanaged charging.
- Avoiding grid congestion, by lowering the load pressure and consequently enabling the more efficient integration of EVs into the power system.
- Taking full advantage of the availability of renewable electricity, therefore increasing the penetration of variable renewable energy within our energy system.

c. Bidirectional charging could also have a key role for the user in:
- Empowering the consumer in the energy transition to an even greater extent, by transforming the electric vehicle into a 'battery on wheels'.
- Taking full advantage, and in particular Vehicle-to-Home (V2H), of self-consumption while mitigating their exposure to high prices for customer exposed to dynamic tariffs.
- Selling back electricity to the grid to bring further significant financial benefits for the consumer.
- Generating further revenue streams for public transport operators and/or fleet managers, in particular in the case of depot charging, allowing reductions to the total cost of ownership and thus offsetting the cost of charging infrastructure while generating additional revenues.[8]

In addition, other technological innovations capable of bringing flexibility to the system in the future – as well as a proper determination of the correct balance between charging modes using a case-based approach - should not be ignored but rather be carefully considered.

3. How to make smart charging work?

An enabling policy framework is needed to unlock these benefits and deliver them to both the electricity system and to society at large. The legal framework should be consumer-focused, coherent, future-oriented, and should allow appropriate reactivity, coordination and data sharing:

a. **Consumer focused:** Any legal framework should create provisions that ensure that those EV drivers who provide flexibility by adopting smart charging solutions receive net positive effect for so doing. Consumer adoption is key to a successful implementation of smart charging technologies, and therefore should be made the central stakeholder.

b. **Consistent**: Any definition and provisions set out in the AFIR, the REDIII and in the revision of the EPBD, should be both mutually consistent and consistent with energy directives in general, in line with the definition of storage. In particular, it will be essential to maintain consistency between the different definitions for smart and bidirectional charging. Furthermore, it will be vital that regulations consistently pursue a level playing field for smart charging and other technologies that provide flexibility to the grid. Consistency between legal definitions should also be ensured by avoiding overlap with the definition of 'digitally connected stations'. To run the smart charging

[7] "Connecting the dots: Distribution grid investment to power the energy transition", Monitor Deloitte, E.DSO & Eurelectric, January 2021

[8] Currently, and assuming that the availability band made available by the e-buses in depot is 50 KW, it is expected that "Bus 2 Grid" will reduce the costs of the infrastructure to zero and generate additional annual revenues of €1000 per bus. Enel Foundation 2021 "Scenari E Prospettive Dell'elettrificazione Del Trasporto Pubblico Su Strada".

system in a coherent way, regulatory framework must also support the different actors of the eco-system to cooperate together, including OEMs, to optimize the benefits while ensuring that batteries are preserved.

c. **Future-oriented**: A legal definition of smart charging should be sufficiently broad, and mention benefits without mentioning technicalities, so as to include future technologies.

d. **Reactivity:** Smart charging should allow adjustments that are rapid enough to deal with grid disturbances and emergencies.

e. **Data**: To ensure this necessary level of reactivity, smart charging requires access to information from the battery management system. On the basis of a contractual agreement, relevant and necessary data should be made available to vehicle owners and users, as well as third parties acting on their behalf.

f. **Cooperation**: Smart charging needs the different actors of the eco-system to work together, including OEMs, to optimize the benefits while ensuring that batteries are preserved.

4. What are the barriers to deployment of smart and bidirectional charging

The fast deployment of smart charging in private and publicly accessible stations does not come without challenges. Regulatory barriers currently exist; in order for there to be a real push on these technologies. The Electricity Market Directive must be implemented, as well as flexibility markets and double taxation eliminated.

5. Our specific policy recommendations for smart and bidirectional charging

a. Incentives and support for the uptake of smart charging should be proposed, as it can offer a full range of additional services compared to regular charging. Bidirectional charging should also be encouraged when demonstrating the positive socioeconomic impact and creating a net benefit for the EV driving consumer who is contributing to the energy efficiency of the entire system.

b. The Platform calls for ensuring the consistency of the RED III with both the new Regulation on the deployment of alternative fuels infrastructure and with the energy performance of buildings directive (EPBD). The current definition of smart charging and bidirectional recharging should be aligned, and any changes to the related definitions and provisions in one text should also be made in the other.

c. The Platform welcomes the Commission's recognition of the role of smart charging in the AFIR for enabling system integration. Improvements should also be made to support smart charging deployment. We therefore call for improvements to the requirements on smart charging (art. 2 and 5.8). You can read more details in our paper dedicated to AFIR here.

d. Time with the vehicle plugged: as important as using a smart charger:

To realise the full potential of smart charging, the recharging points should be deployed at locations where vehicles park for extended periods of time. This allows the flexibility of choosing when to start and stop charging. At or near home is the main one, followed by the workplace. On average in EU, 60% of passenger cars have access to off-street parking at home, where is relatively easy to install a small charger. The other 40% of the car fleet will depend on the urban public infrastructure to recharge their batteries, as most of them won't have access to a parking space at work.

On average, a battery passenger car in the EU consumes around 50 kWh/week. Three main prototypes of public recharging exist: high-power charge stations (equivalent to a petrol station), chargers in commercial areas (typically 22-90 kW) or chargers in residential areas (3.7-11 kW). High power chargers have limited flexibility. Here drivers usually seek the maximum power in the shortest amount of time possible In a commercial area, the vehicle will need between one to two hours a week, while in a residential area, the car can be plugged in for more than 12 hours a day (even more during weekends) replicating the use case of people with off-street parking at home. In other words, in residential areas, the vehicle can be plugged in for 64-times longer than in a commercial location.