

Solutions for a smooth integration of e-mobility into the grid

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- We emphasize the importance of collaboration, early coordination, and formalized cooperation among various stakeholders. We recommend the creation of 'EV charging Blueprints' to guide the organized deployment of charging stations, alongside advocating for discussions at both national and European levels to support grid optimization and investment in electric transportation, including the implementation of existing, relevant EU legislations.
- To support network operators and grid infrastructure, it is required to improve Network Development Plans, enforce regulations, provide digital solutions for DSOs, promote smart and flexible grid solutions, establish proactive grid investments, and reform grid connection agreements to optimize the integration of electric vehicles and charging infrastructure.
- The document underscores the importance of implementing market models and regulatory frameworks that recognize the benefits of both smart and bidirectional charging technologies, emphasising the need for clear rights and conditions to incentivize consumer and operator participation in flexibility, grid support, and Vehicle-to-Grid (V2G) initiatives on a large and harmonized scale.
- A properly functioning of the grids systems requires standardized procedures, harmonised certification, and updated network codes to integrate smart metering and charging technologies, as well as fostering workforce development through mapping skills shortages and promoting training to manage grids and install charging points.



More about the Platform for electromobility

The Platform for electromobility is a unique alliance of Europe-based producers, infrastructure managers, operators, transport users, cities and environmental civil society organisations from across industries and transport modes. Our overarching goal is to reach a sustainable, multimodal transport system in which people and goods are moved across land, inland waterways, sea and air in Europe using exclusively fossil-free electricity. To reach its vision, the Platform unites all sectors constituting the electromobility ecosystem to pragmatically ensure the conditions for the full electrification of new light-duty vehicles by 2035, and build a sustainable European zero-emission transport system by collectively sharing their expertise, challenges and solutions.

For more information about the platform and its members, please visit:

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As the adoption of electric vehicles (EVs) increases, it becomes imperative to step up our efforts to achieve their **seamless integration** - and related charging infrastructure - into the existing power grid. While the development of electric mobility is a significant [asset](#) to a clean energy system, it nevertheless raises questions over the management of power grids and connected charging infrastructure.

Some 60% of the EU car fleet has access to off-street parking space at home, and 'unmanaged charging' can create substantial peak loads. To a greater extent than passenger cars - which would only require a manageable 40kWh/week on average - the electrification of heavy-duty vehicles is a modality that requires specific attention. We have therefore dedicated a specific [paper](#) to this topic. This current position paper aims to **offer recommendations and potential solutions for ensuring that the development of the power grid is consistent and aligned with the growth of electric transportations of all modes.**

There are many topics to consider under the heading of 'e-mobility and the grid', and this paper will present a succinct overview of a number of them. This will be followed by more in-depth papers on selected topics.






I. Communication, Coordination and Collaboration

1) Collaboration to reduce uncertainties

One of the main challenges in planning the electrical grid in a way that can absorb EV charging infrastructure lies in the **uncertainty that surrounds how different types of EVs will recharge in different places. This also makes it difficult to assess needed investments.** These uncertainties can be addressed through cooperation, knowledge-sharing, and effective planning.

Early coordination between stakeholders is key to success. Coordination around how charging infrastructure is deployed will ensure convenience and cost-effectiveness for users. We therefore recommend close cooperation between policymakers, regulatory authorities, energy companies, flexibility service providers, fleet managers, charge point operators (CPOs) and - most importantly - Distribution System Operators (DSOs). Such collaboration will benefit all parties.

In practise, this collaboration should:

-  Be initiated and moderated by public and regulatory authorities
-  Assess the grid in advance - even before any connection requests - and prioritise the flexible use of the grid
-  Recommend reinforcing network components, should any overload be anticipated;
-  Foster communication with municipalities to address network construction requirements when connecting charging stations
-  Streamline the permitting and connection process.

2) Formalising this collaboration through 'EV charging Blueprints'

It is important that this stakeholder cooperation also produce a state of play in the form of '**Blueprint for recharging infrastructure**'.

Adopting a 'Blueprints for recharging infrastructure' approach would help local authorities ensure an organised, planned and coordinated deployment of charging stations. This document - defined

by local authorities and designed in consultation with the relevant stakeholders (in particular DSOs) – will comprise the local planning rules for implementing recharging infrastructure in main highways, national roads, and urban areas, including suburbs, could offer a solution. The ‘Blueprint’ would assess charging infrastructure required (such as the number of points to be installed, their location, their power and the types of socket), taking into account both the existing publicly accessible infrastructure and the existing and expected private charging infrastructure.

From the public authorities’ side, local authorities can leverage these ‘Blueprints’ in their **Sustainable Urban Mobility Plans (SUMP)**s as relevant tools for promoting cooperation and engagement with DSOs and CPOs in the short term. When fully deployed, SUMPs enable an iterative approach with DSOs and other economic actors from the outset, allowing for proactive planning and network development in the short, medium and long term.

3) Coordination & system governance changes needed at all levels

In order for the European regulatory framework to evolve in a way capable of supporting grid optimisation and investment in a coordinated manner, there should be discussions between all regulators at EU level, as well as between the Council of European Energy Regulators (CEER) and the Agency for the Cooperation of Energy Regulators (ACER). The former should be encouraged to act, and the latter to update network codes as needed (see further details below).

4) Implementing existing EU legislations

However, until EU coordination can be established, the work required should be undertaken at national level. This national level work includes the proper **implementation of existing articles of legislations**, such as the Electricity Directive of 2019 (notably its Article 32, which incentivises flexibility procurement by DSOs), the recently adopted Renewable Energy Directive and the reform of the Electricity Market Design, which should be adopted soon and strengthen the existing legislation.

II. Support for Network Operators and grid infrastructure

5) Improve effectiveness of Network Development Plans for EV integration

With the aforementioned coordination and advance information sharing, network development plans - which not least for charging infrastructure for battery trucks are ineffective - can be vastly improved. **National governments must be reminded of their responsibilities** - most notably those set out in the Alternative Fuels Infrastructure Regulation (AFIR) - to enforce these regulations effectively.

Member States, via their National Regulatory Authorities (NRAs) and involving market parties, should make sure - and even encourage - DSOs and TSOs to plan and invest in anticipation. This should be under the supervision of the energy regulator, prior to connection requests for charging infrastructure and should also take into account flexibility options into account.

6) Resources and digital solutions to support DSOs

Many DSOs lack the digital infrastructure to implement solutions that would facilitate and simplify the EV charging connection process. The gaps include:

Digital connectivity between DSOs and CPOs, for the purpose of transparently sharing available grid capacity (for charging). Enhancing transparency offers a crucial advance that could optimise the charge point deployment procedure. A substantial number of charge points are still awaiting installation in a number of countries, as a result of a lack of available information to CPOs on existing capacity. While some DSOs do provide heat/capacity maps, which enable CPOs to plan their deployments accordingly, the majority do not. Generating such maps would significantly enhance the overall process. In addition, there should be:

Digital Ticketing Systems, so that applicants can know the status of their grid connection request and timeframe for replies. **Digital and automatic tools**, which could give historic information on the connection of charging stations in different locations (map-based).

7) Establish cross-functional working group within the DSOs

Coordination and knowledge sharing is also essential **within** the network operators, in order to share expertise and project information across departments, for example. Therefore, DSOs should establish a cross-functional working group within the DSO to address any issues relating to charging station connections.

8) Proactive, anticipatory grid investments required

While private EVs will represent only a fraction of the total grid investment required by 2030, European **distribution grids will still require substantial investments¹** to be able to support e-mobility and to integrate EV charging infrastructure. As DSOs are regulated entities, there must be an adequate regulatory framework established in each country that would allow proactive, anticipatory investments in the grid. This could be on the basis of a small fee approach.

Inspired by the UK's Green Recovery Scheme managed by Ofgem, there should be European funding mechanisms established to enable DSOs to apply for funds specifically for grid reinforcements for EV charging. Moreover, **investments should be made not just in grid expansion but also reinforcement, modernisation, efficiency and flexibility.**

DSOs should be empowered to initiate initial investments that follow with incentives and proper business model to plan ahead. The market needs to develop incentives for the timing of necessary upgrades.

9) Promote local energy hubs through smart regulation

The impact of local electricity consumption for clean mobility can be mitigated, if it is matched with the local energy generation connected and delivered through the grid through smart management of consumption and generation. Building on the energy-sharing Article 15a in the revised Electricity Market Design, this has the dual potential to facilitate grid integration, while increasing direct consumption of clean energy. Realising this dual potential would require **valuing 'energy hubs', where local consumption is matched with local generation.**

10) Invest in and implement smart and flexible solutions

Smart and bidirectional charging can play an important role in optimising the grid integration of EVs, as well as alleviating their impact during peak hours. Thanks to smart meters - in synergy with dedicated measurement devices - **the needs for, and costs of, network capacity reinforcement can**

¹ https://cdn.eurelectric.org/media/5275/debunking_the_myth_of_the_grid_as_a_barrier_to_e-mobility_-_final-2021-030-0145-01-e-h-2DEF801C.pdf

be minimised and the deployment of new charging points optimised, by providing information of the relevant distribution network parameters. Likewise, it would help flattening load peaks. This would ultimately reduce the carbon intensity of the energy system and alleviating the impact on the distribution network.

As non-wire technologies², smart and bidirectional charging enable the application of the Energy Efficiency First Principle. Indeed, by using **already existing technologies**, whose initial purpose lies somewhere else, we avoid expensive investment in new capacity.

The benefits of such service are even more striking when **EVs are turned into energy storage assets** that can return power to the grid through bidirectional charging. This allows for grid balancing, thus boosting grid reliability and stability while lowering the charging cost for consumers. EV charging can also be aligned with local renewable energy production and electrical solutions, such as heat pumps in buildings. Last, much greater amounts of electricity can be moved via existing cables by deploying optimisation tools such as dynamic line rating.

11) Reform of grid connection agreements between (D)SOs and CPOs

To enable flexibility, smart charging and bidirectional power transfer at scale will require smarter grid connection agreements between DSO and CPOs. In particular, in those cases where market-based alternatives for congestion have been shown by the NRA to provide insufficient volumes (in line with article 32 of the Electricity Directive), flexible grid connections should be considered. This will allow for flexible and time-bound contracts or for capacity contracts where the contracted transport capacity is partially or not guaranteed. Such an approach can be implemented in various ways, for example through a so-called 'non-firm Connection and Transport Agreement' or via other flexible agreements.

Clear conditions, to guide consumers, operators and system operators on their rights and responsibilities, are required.

Alongside grid connection agreements, dynamic network charges can assist the adoption of flexibility. These would allow flexible solutions, such as smart vehicle charging and other demand-side measures, to play their part in solving grid congestion.

III. Market models and rules to foster smart & flexible EV charging

12) Market models to incentivise consumers and Charge Point Operators

To provide the required flexibility for the energy system, proper market models and regulatory frameworks are needed. **Flexibility first requires a regulatory-friendly business model**, given the scale of the deployment. While the technology of smart charging is already being developed and recognised within the EU legislative framework, bidirectional charging - despite its considerable potential - still encounters many hurdles hampering its proper development.

Governments, system operators and market regulators must recognise both technologies as beneficial for grid stability, instead of seeing them as beneficials for consumer and as a generator. Fostering a functioning market model will incentivise operators/aggregators to ensure that flexibility is offered on a large scale. Flexibility market demands should be driven by the value they

² Technologies which do not need any grid, Capex investments or more material to install.

bring both to the consumer and the energy system as a whole, not by technology or capabilities. Adopting market models where flexibility plays an important role will only become a reality if consumers see clear benefits or receive incentives to participate. **Without clear rights and conditions for both CPOs, System Operators (SOs), FSPs and consumers, market models will not develop at scale, and consumers will not feel incentivised to participate in flexibility.** This results in a small market where flexibility, V2G and grid support will not be adopted, and grid integrations would remain local initiatives without perspectives at scale and harmonised roll out. In this sense, as already mentioned, it is paramount that Member States swiftly implement the 2019 Electricity Market Design and to already prepare the new changes brought by the current revision of the EMD, which will further strengthen such friendly business models.

IV. Standards to ensure proper functioning of the grids systems

13) Standardise and integrate technologies

Smart metering³, or at minimum dedicated measurement devices, are necessary at the DSO side for grid state information and to measure levels of flexibility delivered. Meanwhile, smart charging technology is required at the CPO side for adapting the charging power and the digital connection between DSO and charging infrastructure. **The development of both technologies – smart metering and smart charging - requires standardised and transparent procedures** to facilitate connections for CPOs. In addition, it needs future-proof communication standards in EVs and in energy management systems, charging infrastructure and building energy management systems.

This requires **simplified conformance testing and compatibility checks**, by means of a harmonised certification on the side both of EVs and charge points. The existing regulatory connection requirements from the ACER may require readjustment to align with current technology. It is important to acknowledge and address obstacles arising from technological limitations.

14) Update network codes

To ensure that EVs and their flexible capacity are able to be integrated into grids, it is important to **adopt EVs in EU based grid codes**, starting with the amendments to the Grid Codes RfG (requirements for Generators) and the new Grid Code Demand Response. It is also important to adopt them in EU grid codes so that SOs and Member States adopt and embrace EVs and corresponding charging point in harmonised rules and regulations.

We also call on legislators to pay particular attention to the revision of the Network Code RfG and the new grid code on Demand Response, taking into account the requirements for V1G and V2G in the grid codes.

15) Workforce development

To guarantee that these measures are truly effective, energy companies and relevant stakeholders must be supported in their **efforts to develop jobs and skills required to manage the grid and the**

³ Smart meters in particular, as one of the solutions allowing smart charging, play an important role in grid management optimisation and flexibility services promotion. The combination of both technologies could provide the system with the necessary data to manage more efficiently the charging process and, thus, reducing the impact on distribution network. Dedicated measurement devices can complement smart meters by providing more data granularity for demand response and flexibility purposes, or substitute them in the situation where a consumer does not have one.

install charging points. Thus, a comprehensive [framework](#) also requires addressing this shortage of skilled and certified workers.

To improve the attractiveness of these jobs and to promote the available training and retraining offers, the EU institutions and Member States should undertake a **mapping of skills shortages**. This should consider both traditional and new skills. That way, we can assess the needs for jobs and skills in each sector, developing tools to identify and publicise available training, and highlight those that need to be created. Practitioners from CPOs and DSOs should be involved in organising training programmes funded by national and regional funds. Last, national and regional communication campaigns should be highlighting attractiveness of these sectors.

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