

Customers and Distribution Grids Working Together for a Fast and Secure Transition to Electric Mobility



DSOs endorse EVs as Part of the Solution

As identified by the European Commission in the European Green Deal and in the legislative proposals of the Fit for 55 package, e-mobility is crucial to decarbonising the transport sector. Transport alone accounts for over a quarter of CO2 emissions in the European Union - the highest producer, ahead of even the energy sector (Figure 1).

The European Union has pledged to become the first climate neutral continent by 2050. This ambitious commitment is now even more pressing following the invasion of Ukraine and priority being placed on reducing fossil fuel dependency from Russia to overcome the energy crisis. To reduce this dependency, electric vehicles (EVs) will play a critical role.

Electromobility is no longer a futuristic concept or a what if scenario – EVs are here to stay¹. In Europe, there are currently 3.3 million EVs on the roads with between 50-70 million expected by 2030². This is positive news for decarbonisation but questions remain: How will these EVs get the electricity they need? Will the grid provide sufficient capacity to make it possible? And when will all this happen?

To ensure all EVs can be charged efficiently, a holistic approach is needed to ensure there is not an over investment in the grid and thus higher costs for all. DSOs within GEODE want to play an active role endorsing and

accelerating the transition towards an electric fleet and be ready with the needed infrastructure to connect EVs to the grid ensuring capacity, efficiency and grid security when the demand requires it. DSOs – as a neutral market facilitator -, also want to be close to customers and support them in this transition. As DSOs we cannot wait until all needed regulations and recharging infrastructure is in place. We need to act now!

In this fact sheet we aim to reflect on what DSOs can do to help a fast and secure transition for EVs. In a nutshell, how the grid can enable this development while helping customers. **Customers and the grid working together!**

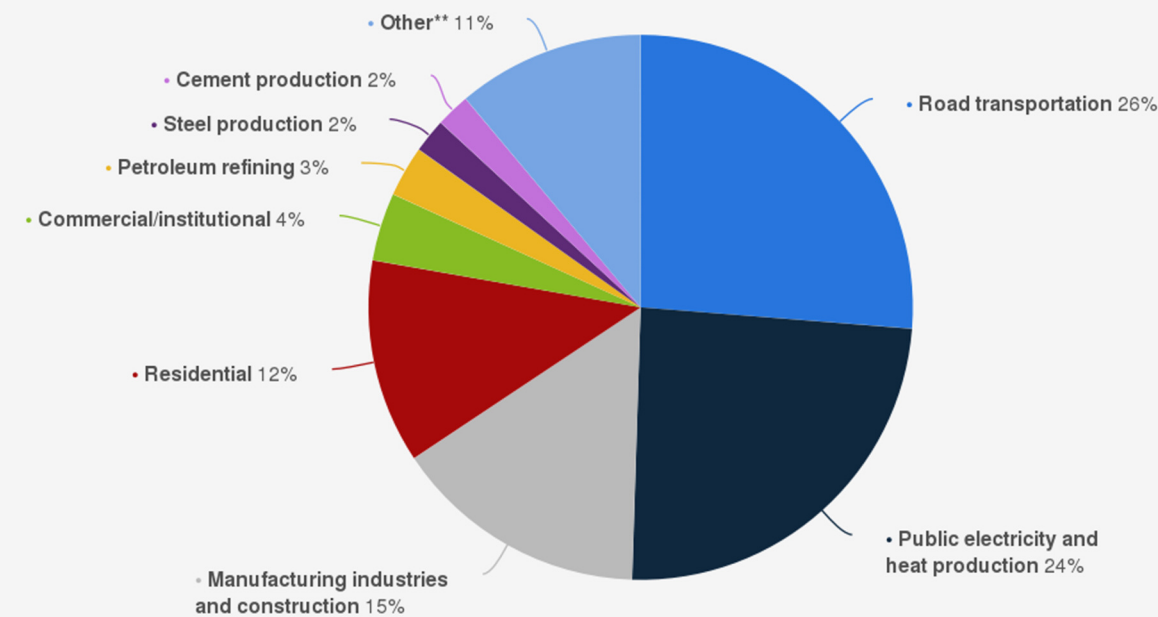


¹ <https://www.eea.europa.eu/data-and-maps/figures/new-electric-vehicles-by-country-1>

² 65 million EVs forecast according to Eurelectric report: <https://eurovision.eurelectric.org/event/2022/report/>

Figure 1

Distribution of carbon dioxide emissions in the European Union in 2020, by key source



Source
EEA
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Additional Information:
EU; EEA; 2020

Figure 1 Source: <https://www.statista.com/statistics/999398/carbon-dioxide-emissions-sources-european-union-eu/>

GEODE Key Recommendations

- European DSOs are ready to facilitate the development of EV charging infrastructure and ensure its connection to the distribution grids. In order to transition faster and at the lowest possible societal cost, the DSOs' expertise should be involved at an early stage in the process.
- Early planning of EVs recharging infrastructure is critical and DSOs should be actively involved at an early stage as overall grid costs can be reduced by following good planning strategy. Incentivising the installation of EV chargers in areas of the grid with good capacity rather than areas with existing heavy loads is crucial. Creating local level maps outlining where to best place loads in collaboration with the local DSO could be a helpful development.
- DSOs are critical enablers of EV development informing customers and providing services to them as expert partners when it comes to capacity needed for chargers, advice on capacity tariffs and illustrating what is best for "smart charging." The EV owner / user (the customer) needs incentives (rewards) to act in the interest of the grid as the EV can be a real asset in the grid through smart charging and vehicle-to-grid (V2G) technology.
- In order to develop a grid market for EV services, a full implementation of the Electricity Directive (UE) 2019/944 provisions, in particular on flexibility, load metering smart tariffs and local flexibility markets is required. The recently started legislative review of the electricity market design is also a great opportunity to accelerate the development of EVs reinforcing provisions on the mentioned aspects as well as strengthening the role of the distribution grid.
- DSO income regulation should proactively incentivise investments in the distribution grid, preparing the grids in advance for increasing amounts of EVs being connected. DSOs are willing to make investments "in advance" as this will avoid putting the grid capacity at risk or delay the deployment of EVs.

DSOs and EV Customers can make the Transition go Faster Together

Key factors supporting the cooperation between DSOs and customers

1. The DSOs' expertise is necessary in order to transition faster and at the lowest possible societal cost

The exponential expected development of EVs connected to the local distribution grid might challenge the capacity and management of the grid. This cannot be ignored. As such, the distribution grid must be ready to handle and accommodate all the particularities linked to EV connection.

When assessing the impact EVs might have on the electricity grid, expected load (in kW) is the key parameter – not the energy consumed (kWh). A high degree of simultaneity of the charging processes – many EVs being charged at the same time in the same area – would bring the existing grid to the limit of feasible performance (grid capacity).

In order to build a grid with the right capacity to handle the impact of EV development, there needs to be a holistic approach to the energy system. DSOs know where there are/might be grid constraints, and where and when it's technically suitable to connect new controllable loads into the existing grid. With overall planning of the system, new load, new generation and new grid capacity, DSOs will meet the energy transition in the most efficient way – both for society and for customers.

Therefore, planning for EV recharging infrastructure is critical and DSOs should be involved at the earliest possible stage. This ensures that grid costs can be reduced by following good strategical planning and incentivising the installation of EV chargers in areas of the grid with good capacity rather than such with heavy loads. Creating maps at the local level showing where best to place loads in collaboration with the local DSO showing capacity availabilities is one of the most helpful things DSOs can do.

EVs can be charged in many ways. They can be charged slowly, over many hours, or fast in a short time. At home, EVs are usually charged slowly with a small load. Charging on a road trip is usually faster which demands higher grid capacity in the local electricity grid. If the demand for charging EVs peaks at certain hours in a certain grid region, it can create huge challenges for the DSOs that need to be able to provide enough capacity for that peak. The distribution grid needs to be ready and this preparedness must start now.

An EV has special consumption needs with diverse capacity demands depending how it's charged. An EV can be connected to a residential metering point one day, or to a fast charging station the next. In addition, most of the time EVs are not even connected to the grid at all.

The fact that EVs are so flexible and relocatable makes it difficult to plan infrastructure around them. In fact, DSOs have to plan grid capacity for several EV locations with fast charging stations needed for holiday traffic, home and work charging points needed to charge EVs when it's necessary and the possibility of a charger at a second house only used for vacation periods - where another DSO could own that grid. That's already three charger/metering points for one EV.

DSOs are critical enablers of EV development empowering customers and providing expertise on capacity needed for chargers, advice on capacity tariffs and illustrating what is best for "smart charging." All while making it as cheap as possible for customers and the system.

Also, when allowed by NRAs³, DSOs can contribute to accelerating the deployment of the needed recharging infrastructure.

³ Electricity Directive EU/2019/944, Art. 33.3

2. Customers can save money

The EV owner/user (the customer) can help the grid, and be rewarded in doing so, by agreeing that they are willing for their EV to contribute to the grid through smart charging and V2G technology. This makes EVs a real asset. However, the customer needs incentives to act in the interest of the grid. Without monetary incentives there is no reason for the customer to invest in, and use, technology such as smart charging and V2G.

Capacity based tariffs that give signals to charge slowly during non-peak hours are a good starting point and the DSO is ready to help customers to understand how they work and how to make the best use of them. Some countries (e.g. Norway) have already rolled out such tariffs, and third parties have started delivering services that help customers act in accordance with the price signals in the tariff⁴.

EVs also have unique features that make them particularly useful as providers of flexibility services to the grid once significant volumes of them are deployed. The average European car spends around 90 percent of its time parked and unused, without a constant need for power which can be reduced from time to time to benefit grid operations. An EV and its battery are also mobile, enabling it to be used as a resource for the grid at different locations.

By providing energy to the grid, EVs can help DSOs' operation and help provide other services such as frequency and voltage control and other balancing services to conquer grid stability challenges. EVs could potentially also be used for backup power in an outage situation providing emergency power for specific functions, such as providing enough power for housing complex lighting.

EVs could also be used as a battery to help solve a local problem in the grid, or as a flexibility product to help with more regional problems in the grid. Airports, hotels, parking lots; they could all make use of EVs when parked, either as a flexibility product when prices are high or during peak hours, or as distributed local production through V2G to dampen overall demand for electricity in the area.

An EV owner who contributes to this utilisation of the grid will also reduce their costs through flexibility markets or tariffs that incentivise smart charging. By matching charging with local PV (solar) production, the need for grid services can be further reduced. By charging EVs consecutively, peak loads can be avoided with little or no comfort losses for the EV owner. Consequently, charging an EV (slowly) at non-peak time, for example at night, gives DSOs a more even load profile thereby reducing grid costs.

⁴ I.e., Tibber, technology and retail supplier in Norway: <https://tibber.com/no/smart-styring/elbillading>

3. The market for third parties will evolve

The market for EV services to the grid is still in the early stages of development. The grid can be utilised more efficiently if the DSO can communicate with EVs or their smart charging stations, either directly or through a third party service provider, supplier or aggregator. Generally, most customers embrace the idea of a third party managing their vehicle's charging outside of peak times and would like the service provider to make smart charging recommendations for them. The key to such development is enough smart EVs participating in the market making services such as automatic load shifting, demand flexibility and aligning EV load with green generation worth investing.

DSOs could contribute actively to EV development by aiding service providers with capacity maps showing the best places for EV charging infrastructure so they can offer different flexibility contracts that are relevant in the chosen spots.

A full implementation of the Electricity Directive (UE) 2019/944 provisions, in particular on flexibility, local flexibility markets, load metering and smart tariffs is also critical. The recently started legislative review of the electricity market design is also a great opportunity to accelerate the development of EVs reinforcing provisions on the mentioned aspects as well as strengthening the role of the distribution grid.

Acknowledgements

GEODE would like to thank the experts from our editing team who kindly gave their time and expertise for contributing to this fact-sheet and in particular our members:

Kjersti Vøllestad, team leader (Elvia, NO)

Roland Tropper (VOEEW, AT)

Martina Theil (Wiener Netze, AT)

Per Everhill (Tekniska Verken, SE)

James Pleass (ENA, UK)