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Roundtable 2 – Conclusions
Integration of EV to the grid: Challenges & opportunities related to network planning and congestion management

Eurelectric has launched a series of Roundtables dedicated to increasing visibility of DSOs viewpoints and perspective on the issues pertaining to the whole E-Mobility ecosystem, reuniting the members of the E-Mobility ecosystem, and identifying the bottlenecks pertaining to the deployment of E-Mobility in relation to the distribution grids.

Introduction:

The second Roundtable was dedicated to challenges and opportunities related to congestion management and network planning. It was preceded by a survey where participants were providing valuable input for the discussions. The roundtable was divided into two parts: a first part dedicated to network planning (I) and a second part focusing on congestion management (II). While the primary focus of this roundtable is the public charging infrastructure, private charging is also mentioned and discussed.

As part of the Commission's REPowerEU plan and Fit for 55 legislative Package, the power system needs to integrate by 2030 over 750 GW of additional wind and solar capacity generation capacity, 50 million of heat pumps and between 50 to 70 million of electric vehicles.

We observe a very fast and important shift towards a much more electrified society where most of the assets are and will be directly connected at distribution level. It is worth noticing that not all the EU countries are tackling simultaneously the electrification of heating, transport and the integration of renewables. In Sweden for instance most of the heating system is already electrified which potentially leaves some grid capacity to connect extra renewables and EV charging stations. On the contrary, in other countries - such as Germany - DSOs observe a fast electrification of the transport and heating segments while at the same there is a need to connect additional Renewable Energy Sources. This might create important challenges for DSOs to manage their grid, notably to avoid local congestion. Thus, network planning and congestion management are crucial tools for DSOs to handle the fast-track electrification, which will be discussed in the present paper.

It is important to distinguish between:

- **Short-term planning: network planning performed for a specific connection requirement (**e.g., integration of a known number of EV chargers in a specific area on a specific network capacity in LV)
- **Mid/long term planning: overall network planning based on mandatory Network Development Plans** to be published by the DSO at least every two years according to Article 32.3 of the Electricity Directive (EU) 2019/944. For DSOs, network development plans describe a mandatory exercise to forecast the development of their network for the next five-to-ten years "*with particular emphasis on the main distribution infrastructure, which is required in order to connect new generation capacity and new loads, **including recharging points for electric vehicles**.*"

In both cases, the final goal is to prepare the grid for the energy transition by implementing interventions in advance to increase hosting capacity (i.e., ensuring that grid capacity is there when new demands are issued) while also considering the **most cost-effective solution**. It also aims at identifying parts of the network where congestions could happen to avoid threatening **security and quality of supply.**

1. Grid forecast for EV integration:

1.1 On DSO Network Development Plans

The Network Development Plan (NDP) aims at estimating the impact of additional future loads (and other important developments), including EV charging infrastructure, on the distribution grid and thus plan network development in the mid- to long-term accordingly. **This is a forward-looking exercise where access to reliable and accurate forecasts of future electrification trends is key**.

Two main approaches exist when it comes to performing an NDP:

- **Bottom-up approach** using information gathered from connection requests as well as prognosis and scenarios on the upcoming number of chargers in the future
- **Top-down approach** based on scenarios set by the EU and the Member States and acquired at a higher macro level

1.1.1 On the two approaches

On the Bottom-up approach:

- In the case of Vattenfall Eldistribution in Sweden, both approaches are being used for the past two and a half years. The key input for bottom-up approach is based on information gathered from municipalities, industries, corporate users. That data allows Vattenfall

Eldistribution to better understand where EV chargers will be located and when the charging will be executed.

- A key issue for the bottom-up approach is the **granularity of data** and the thoroughness of the exercise that needs to use a variety of data sources and information.

- However, the participants that performed both approaches generally indicate their **preference for the bottom-up approach** which tends to be more precise and comprehensive. This methodology is relevant for forecasting more granularly and accurately the network loads at every voltage level (high, medium and low).

- This approach can also **foster advanced transparency between DSOs and relevant stakeholders,** allowing for more dialogue between DSOs and CPOs and a better sharing of information on the charging point location given the state of the network regarding its capacity, cost to upgrade the grid, permission of landlords.

On the Top-down approach:

- In the case of Germany for instance, some DSOs use data from the Study "Mobilität in Deutschland"[1] (Mobility in Germany) and break it down to a more micro level of their concrete network area.

- The key input for top-down down approach is acquired at a higher macro level and consists for instance of the REPowerEU targets, Bloomberg data, national data plans, technical agencies data.

Holistic approach needed for Network Planning:

It appears that both approaches are complementary, and participants are using blended approaches mixing both top-down and bottom-up approaches, experimenting with new methodologies, and expanding their data collection as much as possible. **The transposition of the mandatory NDP into national law has also changed practices:** for instance, in Portugal, the original practice was to build 5 years plans every 2 years, with the enforcement of the mandatory NDP, the same NDP is revised every two years. While these roundtables are focusing on E-Mobility, participants stressed out that NDPs must take into account other loads such as heat pumps or PVs as well as the expected RES deployment plus flexibility developments that will heavily impact the grid.

1.1.2 Accuracy and reliability of the forecast is a challenge:

Lower voltage levels pose a particular challenge for developing 5-to-10-year plans, as their development is driven by customer connection requests, RES (i.e., rooftop PV) and heat pump deployment, as well as other investments needs in low-voltage network – such as in renewal and automatization plans to provide observability and controllability - and thus needs to take a different

[1] http://www.mobilitaet-in-deutschland.de/ The study is undertaken regularly for the Federal Ministry for Digital and Transport. It is based on a survey of about 160.000 German households. The central task of the study is to obtain representative and reliable information on the sociodemographics of individuals and households and their everyday traffic behavior (e.g., trips by purpose and mode) for an entire year. Weighted and extrapolated, it serves as a framework and supplement for other traffic surveys, such as the traffic surveys in individual cities.

form within the Network Development Plan compared to higher voltages, which consists more in network monitoring and visibility at the higher voltage levels.

The participants of the roundtables were unanimously stressing the importance of accuracy and reliability of the data – especially for load profiles which are crucial for DSO planning since load aggregation is particularly complex and is done at a deeper level on top of planning additional EV chargers while being a key element for the EV charging infrastructure planning success – as two fundamental pre-requisites in their Network Development Plans.

1.1.3 Key parameters and sources of data:

The participants of the roundtables were unanimously stressing the importance of accuracy and reliability of the data – especially for load profiles which are crucial for DSO planning since load aggregation is particularly complex, is done at a deeper level on top of planning additional EV chargers and is a key element for the EV charging infrastructure planning success – as two fundamental pre-requisites in their Network Development Plans. In this regard, **the creation of an EV/DSOs coordination process** aimed at sharing knowledge and benchmarks would be crucial; this would facilitate effective planning by DSOs. Indeed, coordination for knowledge sharing and reference values is key.

Parameters	**Source of data**
A forecast of the total number of EVs on the road, the main models and the type of EVs used, their average mileage and average consumption	• Aggregated national sets of data • National data plans • Report from OEM associations or OEM specialized organisms
The probable density of charging points and their power requirements (ultra-fast/fast/slow charging) in the considered area as an input for the planning of secondary substations	• Aggregated national sets • AFIR targets for fast charging • Bloomberg data • National data plans • Information gathered from connection requests
A comprehensive 24h cycle of a charging point as well as a forecast of the EV charging simultaneity factor and the utilization rates of charging stations, taking into account behavioral patterns of the drivers such as charging location (e.g. home charging or public charging) and use of smart charging solutions and dynamic electricity prices	• Bloomberg data • Technical agencies data. • Aggregated European data sets • Report from CPOs associations or CPO specialized organisms
The timing and magnitude of EV charging power e.g the load profile of the charging point as a complementary information to the number and location of chargers	• Aggregated national sets of data such as the climate and energy plan in Spain are commonly used as a reference point to assure accuracy and reliability of the data set throughout the sector.

	• REPowerEU targets, Bloomberg data, national data plans, technical agencies data. • Information gathered from connection requests as well as prognosis and scenarios on the upcoming number of chargers in the future • National studies
Traffic and driving patterns including Cyclical/Holidays patterns of usage depending on the season, the location of EVs and the most impacted areas	• Aggregated national sets of data • Bloomberg data • National data plans • Technical agencies data • Google maps and traffic tracking data sources
The loads of additional electrification trends and their evolution (e.g. electrification of the heating sector and integration of heat pumps)	• Aggregated national sets of data • REPowerEU targets • Bloomberg data National data plans • Technical agencies data. • National studies

DSOs use these parameters to develop various EV charging scenarios and predict future load profiles for their systems. Such profiles are then used to analyse the voltage and current load on network components to ensure that the network can satisfy all future loads.

Article 32(4) of the Electricity Directive states that DSOs shall consult relevant system users as well as the TSOs on their network development plan. The category of relevant system users will most likely be defined at national level.

Proposed solutions:

- **Amend Article 32(4) of the Electricity Directive in a way that would extend the category of system users to CPOs, OEMs, MSPs or their relevant associations as well as technical agencies and other stakeholders when relevant.** They can usefully provide information and data related to the above-mentioned parameters to improve the accuracy of DSO's forecast. When elaborating their network development plans, DSOs shall take into consideration how the deployment and operation of recharging points could enable electric vehicles to further contribute to the flexibility of the energy system including their participation in the balancing market, and to the further absorption of renewable electricity.

- **Mandatory publication of the consultation's outcome e.g. via visible announcement on a DSO website /NRA website when relevant.** Such consultation will allow for instance CPOs, OEMs, MSPs and local/national authorities to have transparency in the process and an overview of the outcomes for DSO decision making. By providing more information about current and future network requirements, DSOs will help the E Mobility industry to identify opportunities – notably to support the electricity system thanks to flexible assets.

1.1.4 On sensitivity of data

Obviously, not all the data content that was discussed previously is readily available. Especially information on the future development of EV technology and thus expected car sales might be sensitive and subject to cartel law restrictions. Some companies might also be reluctant to share such data.

In the Nordic context, getting information on the usage of cars and the charging patterns will help accessing information necessary to dimension the grid. This information is fetched at a granular level. The information shall be acquired not at individual level but at station level on the low voltage level to help achieve forecasts and NDPs.

However, one key aspect of data is its possible infringement to the privacy of the final customer and the sensitivity of data for business opportunities.

One way to circumvent this problem is to **use data aggregated and anonymized at national and European level** that could be coupled with collaborative and advanced transparency tools such as **pre-formatted maps**. These maps allow both parties to interact together: CPOs may start the process by telling the DSOs where he wants a charging point, DSOs might answer where the better location from the electricity network point of view would be and the two could continue their exchange back and forth.

Existing projects include:

- The hosting capacity map by Atlantic city electric that presents a map indicating how much generation can be added in a feeder before the feeder reaches its capacity limit[2]
- The ConnectMore Interactive Map by SP Energy Networks [3]
- The Tennet Grid capacity map at TSO level[4]
- The network capacity map application by National Grid [5]
- The detailed maps of the grid capacity for recharging points (50kW, 100kW, 150kW) by UK Open Power Networks[6]
- The European Commission European Alternative Fuels Observatory TENtec interactive map[7] which has an updated map of all public charging stations. By adding hosting capacity, this would become the first EU-wide accessible and publicly managed source.

[2] https://www.atlanticcityelectric.com/SmartEnergy/MyGreenPowerConnection/Pages/HostingCapacityMap.aspx
[3] https://www.spenergynetworks.co.uk/pages/connectmore_interactive_map.aspx
[4] https://www.tennet.eu/de-elektriciteitsmarkt/congestiemanagement/grid-capacity-map,
[5] https://www.nationalgrid.co.uk/our-network/network-capacity-map-application
[6] https://dgmap.ukpowernetworks.co.uk/site/?q=ev_ext

[7] https://alternative-fuels-observatory.ec.europa.eu/interactive-map

Proposed solutions:

- Advocate for the use of **data and metadata aggregated and anonymized at national and European level** potentially coupled with collaborative and advanced transparency tools such as **pre-formatted maps.**

1.1.5 Grid building on forecast

Most DSOs in Europe would agree that today they are not **incentivized** to build grid on forecast. On the contrary depending on the details of the national regulatory regime, any DSO building "significant capacity reserves" into its system might face significant disadvantages:

a) **General cost allowance risk**: Most regulators tend to look at investment figures yearly. If investment rise over proportionally in some assets or more than a certain threshold above last year's figure this will automatically call for some additional explanation by the DSO, especially when there is no apparent continuity of service problem. Without a clear mechanism for forward-looking investments (e.g., based on common scenarios) DSO face a recognition risk – which might also spill over into "normal" investments if the regulator was considering the DSO to be "overstepping".
b) **OPEX recognition**: if OPEX also rise with CAPEX (and they will sooner or later) the DSO might be disadvantaged because while most systems adjust RAB quickly / yearly these days, OPEX remain under a budget constraint i.e., are outperformed by decreasing costs, while increasing cost automatically jeopardize profits.
c) **Capped investment**: in some countries, DSOs investment plans cannot exceed a certain amount. Grid building on forecast would require significant investments that will likely go beyond the cap. It is therefore important to explain to the relevant Authority that the rationale behind capped investment does not match the challenges posed by the huge ramp-up of EVs, heat pumps and PVs, and shall be changed.
d) **Efficiency risk**: Forward-looking investment also induces a risk in the efficiency benchmark especially when a ToTEx-regime in regulation is being applied. Any DSO that will invest in a forward-looking manner therefore face the risk of an efficiency "penalty" as the already has incurred costs that are not yet explained by any structural parameters e.g., increased load, larger number of load points, kWh transported etc.

The participants acknowledge that there is a **regulatory obstacle** which should be overcome in the future to prepare the grid even better for the transition to electrified transport. National Regulatory frameworks must be designed to incentivize a **forward-looking investment by DSOs** on a longer-term horizon (2040 for instance). The participants of the roundtable are therefore calling for a regulatory environment that would not hinder DSOs from building grid on forecasts. Furthermore, grid building on forecast should be based on dialogue between DSOs and relevant stakeholders.

Proposed solutions:

- **Make a provisional regulatory mapping** of proposed measures and add a clear statement that national regulation should be designed in a way that it is not an obstacle to **grids being built on forecast until 2040**. Possible options include a proper implementation of the Clean Energy Package specifically:
  - The Electricity Regulation
  - Article 18 of the Electricity Directive

- Article 32 (3) and (4) of the Electricity Directive
- The relevant national legislation

- Acknowledging **the need for growing electricity grids** also in the legal texts at least as long as the sector is on its way to reach net carbon zero by 2050.

- Support **ambitious targets for preparing buildings for fitting charging points, by installing pre-cabling in** The Energy Performance of Buildings Directive (currently under revision). These targets can be part of DSOs grid forecast.

- **Implement long-term grid planning** (integrated with transport and parking policies, including SUMPs) and investment consistent with the planned expansion of recharging infrastructure, considering the current and future requirements in the rollout of alternative fuels infrastructure, under the Alternative Fuel Infrastructure Regulation (AFIR).

How to move from a backward-looking model towards a forward looking one?

Answer might lie in:

- New ways of measuring efficiency or skipping cost for upfront investments from the benchmark at least until the next regulatory period or even longer focusing on long term and not short or medium term
- New ways of sharing risk. E.g., if DSO can´t provide the market with enough capacity where it is needed and when it is needed, the vehicle OEMs are risking not reaching their sales targets. It is important to realize that while grid building on forecast increases risk of the business with stranded assets, not taking action now pose huge risks for the future with the increases loads of EVs, PVs and heat pumps. There should be a more balanced risk sharing between the E-Mobility ecosystem actors.

Particular challenge of heavy-duty vehicles, buses and fleets to be integrated in the Network Development Plan

However, it is important not only to focus on passenger cars at individual level but also to consider the transport and logistics sectors who are also feeding into the EV ramp-up.

1.1.6 On the topic of logistics:

The logistics sector is crucial and shall be considered by DSOs. For instance, in the logistics company Amazon, a 1-billion-euro investment over 5 years will bring the LDV (Light-Duty Vehicles) number to 10 000 and the number of HDVs (Heavy-Duty Vehicles) to 1.500 in Europe. It is therefore crucial to understand the different driving cycles, use-cases, and patterns depending on the season and the purchase habits of its of final customers i.e., for logistics the weeks before Christmas are probably the busiest in the year and will also be those weeks where any sensible prognosis should see the load peak from connections being used by logistics companies.

The challenge of integrating logistics raises the following question for DSOs: should the maximum peak load be the basis of sizing the connections that logistics depots will use or could several scenarios for optimising consumption be established for a depot that seeks connection, e.g. one where trucks' optimised charging overnight can be taken as the base case?

This has been done in several cases for electric bus depots and several millions of Euros could be saved by operators, DSOs and investors while gaining insights in grid use by these new consumers.

Grid integrated planning practices shall be further explored and encouraged and could be extended to electric bus and depots which are rapidly electrifying HDVs.

1.1.7 On the topic of transport:

The focus shall not be limited to charging point level, but also to TEN T networks and highway charging for HDVs and fleets.

There are technical specifications and requirements of charging and refueling infrastructure for battery and fuel-cell electric heavy-duty vehicles which are distinctly different from those for cars.

Particularly with respect to:

- Locations of charging and refueling stations
- Space requirements
- Minimum power output levels

In the case of truck operators, a wide high power fast charging network is needed especially when consider "opportunity charging" (i.e. charging activities carried out along the road and outside the logistic and depot premises where typically the HDV could spend the night so where the required power demand could be lower compared to the one required for short stops in publicly accessible charging points).Truck drivers need to perform a mandatory stop of at least 45 minutes after 4,5 hours of driving. These rules pose heavy constraints on the characteristics of future charging point for trucks in terms of power output (a truck shall be charged in 45 minutes) and location (truck operators want to recharge where they usually stop today).

In the European Commission's initial proposal to revise AFIR, it is stated in article 4.1 that:

"Member States shall ensure a minimum coverage of publicly accessible recharging points dedicated to heavy-duty vehicles in their territory. To that end, Member States shall ensure that:

(a)along the TEN-T core network, publicly accessible recharging pools dedicated to heavy-duty vehicles and meeting the following requirements are deployed in each direction of travel with a maximum distance of 60 km in-between them:

(i)by 31 December 2025, each recharging pool shall offer a power output of at least 1400 kW and include at least one recharging station with an individual power output of at least 350 kW;

(ii)by 31 December 2030, each recharging pool shall offer a power output of at least 3500 kW and include at least two recharging stations with an individual power output of at least 350 kW;

(b)along the TEN-T comprehensive network, publicly accessible recharging pools dedicated to heavy-duty vehicles and meeting the following requirements are deployed in each direction of travel with a maximum distance of 100 km in-between them:

(i)by 31 December 2030, each recharging pool shall offer a power output of at least 1400 kW and include at least one recharging station with an individual power output of at least 350 kW;

(ii)by 1 December 2035, each recharging pool shall offer a power output of at least 3500 kW and *include at least two recharging stations with an individual power output of at least 350 kW; "*

Where logistics depots or freight centres are not public, requirements to accelerate electrification can be set by including electrification of logistics as a use case in the current revision of the Energy Performance of Buildings Directive.

Proposed solutions:

- Call for the implementation **of ambitious technical requirement for HDVs and LDVs**s[8]: Along the TEN-T core network and comprehensive network, publicly accessible recharging pools dedicated to light-duty vehicles and meeting the following requirements are deployed in each direction of travel with a maximum distance of 60 km in-between them:
  - (i) by 31 December 2025, each recharging pool shall offer a power output of at least 600 kW and include at least one recharging station with an individual power output of at least 300 kW
  - **(ii)** by 31 December 2030, each recharging pool shall offer a power output of at least 900 kW and include at least two recharging stations with an individual power output of at least 350 kW

  Along the TEN-T core network, publicly accessible recharging pools dedicated to heavy-duty vehicles and meeting the following requirements are deployed in each direction of travel with a maximum distance of 60 km in-between them:

  - (i) by 31 December 2027, in each safe and secure parking area at least two recharging stations dedicated to heavy-duty vehicles with a power output of at least 100 kW are installed and enabled for smart charging
  - (ii) by 31 December 2030, in each safe and secure parking area, at least four recharging stations dedicated to heavy-duty vehicles with a power output of at least 100 kW are installed and enabled for smart charging
  - (iii) by 31 December 2025, in each urban node publicly accessible recharging points dedicated to heavy-duty vehicles providing an aggregated power output of at least 1 400 kW are deployed, provided by recharging stations with an individual power output of at least 350 kW

[8] The revision of the AFIR legislative file is currently under discussions as this document is released with the Parliament version showing more ambitious targets in Article 3 and 4 compared to the Commission Original Version and the Council General Approach.

(iv) by 31 December 2030, in each urban node publicly accessible recharging points dedicated to heavy-duty vehicles providing an aggregated power output of at least 3 500 kW are deployed, provided by recharging stations with an individual power output of at least 350 kW

- **Call for including** **logistics** **as a use case in the revised EPBD,** in particular in requirements for **pre-cabling depots** (giving depot owners more flexibility as to the charging solution and capacity installed), by changing definitions of non-residential buildings with "adjacent car parks" to "adjacent vehicle parkings".

1.1.8 On data access to third parties (DSO → market):

New business models allowing access to DSO data to third parties (CPOs, eMSPs, OEMs, Aggregators) shall be explored: maps using a colour code (green, orange, and red) displaying information on how congested or available charging points within a certain area are.

Likewise, a **colour code map giving information on how congested or available the grid** is and EV drivers connected to this mapping could also be an alternative or another tool for the management of EV planning for EV chargers. However, it is important to distinguish between structural congestion and exceptional congestion that does not jeopardise EV charging investments.

These maps shall use aggregated and anonymized data at national and European level and allow a more proactive, collaborative and advanced transparency approach between involved parties. These maps shall be defined in more details. However, it is to be noted that these maps should be used as preliminary assessments and not as contractual bindings for DSOs. Only the official request of a connection must be considered for real cost and times of realization.

Access to data related to grid planning constitutes an important component in the development of **business opportunities.**

This may be enhanced by a proper Regulatory Framework. In that respect, **the article 23 and 24 of the Electricity Directive 2019/944** states the European Regulatory framework for data management, interoperability requirements and procedures for access to data:

- "The *Commission shall adopt, by means of implementing acts, interoperability requirements and non-discriminatory and transparent procedures for access to data referred to in Article 23(1) i.e."*
- *"When laying down the rules regarding the management and exchange of data, Member States or, where a Member State has so provided, the designated competent authorities shall specify the rules on the access to data of the final customer by eligible parties in accordance with this Article and the applicable Union legal framework. For the purpose of this Directive, data shall be understood to include metering and consumption data as well as data required for customer switching, demand response and other services*."

Participants also welcome the launch of a recent European initiative by the European Commission i.e. creation of an **energy data space and a digital twin** of the energy grid in the framework of its Energy Digital Action Plan. The common European energy data space shall be deployed by 2025, building on information sharing mechanisms and access rights as defined in the EU's Data Governance Act and Data Act, among others. While the digital twin is a virtual replica of a physical entity that informs decision-making in real time to make processes more efficient.

Possible solutions:

- Support for the **creation of an energy data space and a digital twin of the energy grid** as launched by the European Commission in the framework of its Energy Digital Action Plan.
- Support a **mandatory publication of NDP** on DSO's website for instance.
- Create **fair and transparent data access requirements** (e.g. DSO portals) in the ongoing drafting of Implementing Acts on data access & interoperability as set in article 24 of the Electricity Directive 2019/944 "Interoperability requirements and procedures for access to data"

It is also important to **open the box for data sources**: chairs and university institutions allow the access to more comprehensive data sources and analysis on traffic flows and consumer patterns, the use of Google Maps to track traffic volumes and patterns can also reveal new insights as well as consumer association research. National association may also negotiate their industry wide usage of data by the DSO/industry.

Furthermore, the in-house development of IT and scientific competencies can also prove crucial as well as transversal projects between actors such as the FLOW project which aims at promoting the concept of electric mobility by bringing together CPOs, DSOs, eMSPs and car manufacturers. [9]

Proposed solutions:

- Support mandatory implementation of a **consumption tracking device for EVs** which data will be transmitted, aggregated, and anonymised at European and National level in the future cars/vans CO2 standards, in a similar fashion to the Commission Implementing Regulation on the monitoring and reporting of data related to CO2 emissions from passenger cars and LDVs.

- Encourage CPOs, MSPs, OEMs and public authorities to provide DSOs crucial insights on these parameters in the framework of the Network Development Plan's consultation thanks to the following tools:
  - Forecast exercise by a bundle of CPO at national level
  - Forecast exercise by a CPO association at national level
  - Forecast exercise by the relevant public authority at national level
  - Pre-formatted connection maps issued by OEMs
  - For OEMs, pre-formatted maps on fast chargers for HDV/LDV
  - For CPOs, pre-formatted maps on charging infrastructure
  - For municipalities, SUMPs with pre-formatted maps on municipal charging points
  - For public authorities, development plans with future charging points

[9] https://www.enel.com/content/dam/enel-common/press/en/2022-july/PR%20Flow.pdf

- Studies by CPOs on EV ramp-up
- Studies by OEM conglomerate on EV ramp-up

1.2 Network planning exercise for a specific connection request

When performing a network planning exercise following a connection request for a specific asset, DSOs assess a wide set of parameters related to the characteristics of the distribution network in the considered area, to the future load in this area but also to the location as well as power and capacity requirements of the chargers.

More specifically, in the case of a specific project, these factors generally include:

- The **exact location of the charging station, and number** of already existing charging points
- When available, the **technical features of the chargers** such as the type of connection (AC or DC and 1 phase vs 3 phases), the charging speed (e.g. slow or fast charger), power quality use (mainly harmonics from rectifiers or the existence of power input into the grid (V2G technology)
- The **requested power capacity** for the charger or set of chargers; the simultaneity factor
- The **use of smart charging solutions** e.g controllability of the EV charging point(s) via load shifting, energy management of the charging station
- The **capacity of power lines and power transformers** in the considered area and at the connection point.

These parameters are evaluated by the DSO to analyse impacts of such charging infrastructure on the peak power demand and the distribution system.

DSOs thus evaluate the network situation and can identify the best suited grid connection point from the network point of view as a voluntary alternative that the requesting party can opt for. Finally, they can assess if grid reinforcement is necessary in that particular case or if a flexible solution (e.g., load management customer site) or a grid-serving control could be deployed in order to avoid or postpone grid reinforcement. Parties requesting connections might be even more inclined to use the afore-mentioned technologies if the DSO were able to offer them "non-firm access connection agreements" in addition to the only firm access today. From a DSO as well as customer perspective such arrangements might be beneficial if more connections can be facilitated in a shorter amount of time as otherwise necessary expansions can be delayed.

Proposed solutions:

- **Promote "non-firm access connection agreement" or "voluntary conditional agreement"** which allow to create more connections and a better load management for the short to medium term. These agreements will be made on a voluntarily basis and serves as a transitory measure to grid reinforcement. Processes for this should include the evaluation of how existing capacity is available locally and can be readily tapped into before new capacity is being built.
  It is a possibility for CPO to build its own connection by already designing their charging station for its final demand/load prognosis. Later the CPO may have the possibility to sell

or lease its connections to the DSOs (e.g. iDNO which is licensed to build connection where the DSO have resource or capacity problem).

More specifically, non-firm access connection agreements could benefit the final customer and the DSO:

- By increasing the number of available locations for charging, these connection agreements could help decrease the charging prices for final customers while incentivize customers to deploy storage equipment and kickstart demand side flexibility
- For the DSO, its control over the loads and consumption will greatly help them in his activities

2. E Mobility integration – the challenges of load peak and congestion

An unmanaged approach to charging infrastructure risks creating major congestion. Already heavily loaded grids could become bottlenecks in eMobility rollout.

The greatest impact in increased load from unmanaged charging will be felt where the EV peak coincides with the peak in general electricity usage.

Multi-unit dwellings can expect peak load to increase by 88%; highways that cater for high-powered charging will see peak load rise by 87%. Transformers are expected to operate beyond their rated capacity. Transformer utilisation ranges from 93% to 166%, depending on use case.[10]

When DSOs are looking to solve or prevent network congestion, all options (or a combination of options) should be considered. The solutions may include reconfiguration of the network, flexible connection agreements, traditional reinforcement (i.e. networks and substations), procurement of distributed flexibility, network tariff etc. During the third roundtable, we explore in more detail how to make the grid greener and more flexibility, in particular thanks to the smart charging and V2G technologies.

Proposed solutions:

- After acknowledging the benefits created by smart charging, advocate **for a mandatory obligation regarding smart charging**[11]. National best practice from the UK is the Smart Charge Points Act 2021 setting smart charging as default mode for all new charging points, including mandatory consumer information on benefits from savings.
- Promote **technologies providing flexibility to the grid** e.g. V2G solutions (subject of round table 3)
- **Support a European Regulatory framework for Demand Side Flexibility** (e.g. the future Network Code on Demand Response as set in article 59 of the Electricity Regulation)
- Set up a proper regulatory framework to set **adequate remuneration schemes** for the grid investment with longer term vision and a more innovative approach

[10] https://www.eurelectric.org/media/5704/power_sector_accelerating_e-mobility 2022_eyeurelectric_report-2022-030-0059-01-e.pdf

[11] The revision of the AFIR and EPBD legislative files are currently under discussions as this document is released.

- More particularly, increase rewards for EVs' participation in power markets as flexible resources to allow **value-stacking** of smart charging services, which in turn support demand side flexibility and optimal grid use
- Make publicly available the appreciation of **EVs flexibility potential** which shall be based on a common European methodology, to be defined by **ENTSO-E and the EU DSO Entity**