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SHAPING SMARTER GRIDS FOR YOUR FUTURE

Powering the shift: Key recommendations for a grid-friendly scale up of battery collocation in EV charging points.

Brussels, August 2025

1. Introduction

Over 30 participants gathered in person and online for a roundtable on Battery Collocation, a strategic solution to accelerate the deployment of Electric Vehicle (EV) charging infrastructure in grid-congested areas. Battery collocation refers to the integration of a Battery Energy Storage System (BESS) at EV charging sites. These batteries are typically charged during off-peak times or from on-site renewable generation (i.e. solar PV) and can use the stored energy to supplement the supply from the grid during EV charging. This approach can alleviate technical and regulatory bottlenecks but also raises new challenges. The session brought together Distribution System Operators (DSOs), Charging Point Operators (CPOs) and other key stakeholders to share experiences, identify challenges, and develop policy and technical recommendations to scale battery collocation across the EU in a grid friendly way. The roundtable was organized by the E.DSO E-mobility Working Group, under the chairmanship of Jan Salanda, with the support of the Platform for E-mobility, Charge Up Europe, Atlante and Electra. During the roundtable, real-life pilots from E.DSO members ESB Networks and E.ON demonstrated the potential of batteries to support EV charging in congested zones. Atlante and Electra, representing the CPO perspective, shared lessons from integrating batteries into charging infrastructure.

2. Key benefits of battery collocation:

A central theme of the roundtable was an examination of the specific benefits of battery collocation.[1] Participants agreed that this approach can significantly accelerate the deployment of charging infrastructure and support the electrification of transport by reducing the dependency on immediate grid reinforcements. Batteries help optimise grid connection processes by acting as a buffer between the charging station and the grid, enabling faster approvals and installation.

In a use case presented, the CPO could connect a 550 kW EV charging site utilising a 100 kVA connection from the DSO. By leveraging the stored energy in the BESS, the site was able to supply peak charging demand of up to 294 kW, far exceeding the nominal grid connection limit. When demand spiked, the battery discharged its stored energy to supplement the grid supply, enabling a combined output of nearly three times the contracted grid capacity without overloading the local distribution network. In another use case, the installation of a battery allowed the charging site to deliver up to 120 kW of power despite having only a 100 kVA grid connection.

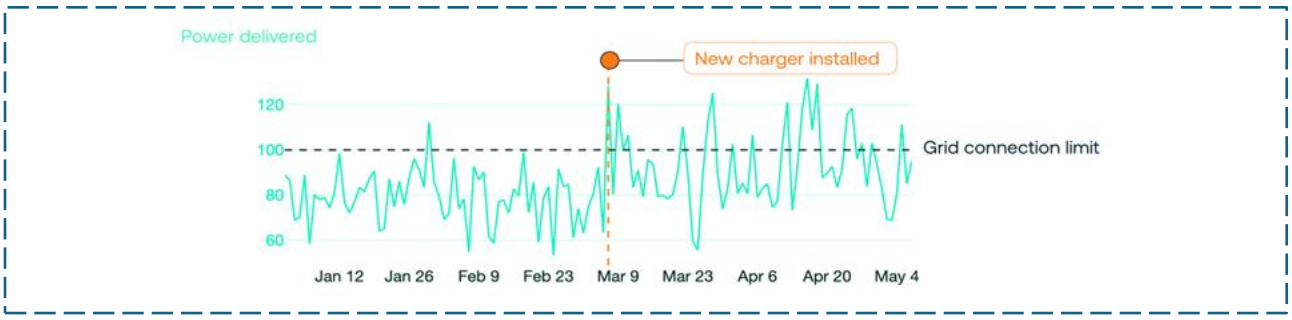

Figure 1: Electra Pilot Project presented in the roundtable to show the increase in the power delivered after installing an EV charging with BESS.

[1] Note that according to European law, DSOs cannot themselves own battery storage nor charging points under normal circumstances.

If used and installed in the right way, batteries can also mitigate the need for costly and time-consuming grid upgrades, reducing the need for additional construction works and providing a space-efficient alternative to traditional solutions such as large transformers, which offers an important advantage in dense urban areas.

By reducing grid congestion and allowing DSOs to better manage peak demand, battery collocation can lower operational costs and can result in more affordable charging prices for EV users. Additionally, batteries enable peak shaving and can create new revenue streams for the e-mobility ecosystem, for instance, battery collocation can reduce operating costs for CPOs through the optimisation of energy sourcing. Moreover, if the right local flexibility markets are in place, battery collocation in EV charging points can lead to the creation of additional revenue streams to CPOs and deliver valuable grid services: both in the short term by providing flexibility and in the long term through the provision of ancillary services.

3. Technical challenges of battery collocation:

Integrating batteries into EV charging infrastructure introduces new complexities and potential risks for grid operation. From a DSO perspective, the challenges related to connecting EV charging sites with BESS to the electricity networks relate to the following topics: compliance with the grid codes and connection standards, power quality, coordination with existing and planned grid infrastructure, and ensuring the contracted maximum import and export capacities are not exceeded under any circumstances. Battery systems typically use power electronic inverters, which have the capability to both import and export electricity. Even if the system is initially designed to operate in a non-export mode, it's important to consider the potential for export during the grid connection application process. This ensures that the network is properly assessed, designed and protected, accounting for all operational scenarios.

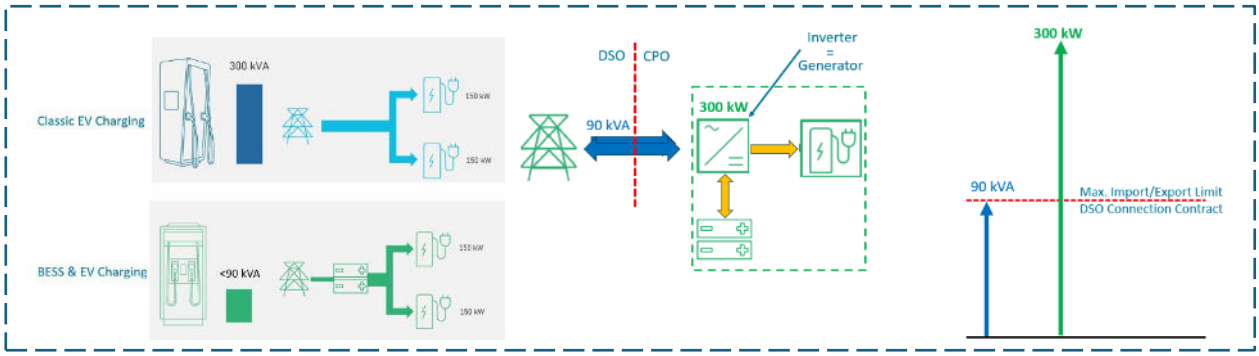

Figure 2: Relation between maximum import/export capacity limits and connection contracts in the case of classic EV charging vs. BESS and EV Charging (ESB Networks)

As discussed above, when a BESS is collocated with a charging station, it can deliver power far beyond the nominal capacity of the grid connection. For example, a site with a 90-kVA grid connection may be used to supply up to 300 kW of power during peak EV charging times thanks to the BESS. While this is beneficial for managing high loads without major grid reinforcements, it could introduce significant protection and safety challenges since the local distribution grid and its protective equipment is designed based on the contracted grid capacity, in this case, 90-kVA. This discrepancy

means that, in the event of a malfunction of inverters' software or application of a new firmware or failure of circuit breakers or protection systems, there is a real risk of local power outages or even damage to grid infrastructure. Another concern is the operational strategy for charging and discharging the batteries. If batteries are charged purely based on low market electricity prices, without coordination with the grid operator, they could increase demand during already congested periods, aggravating grid stress rather than alleviating it. This behaviour could lead to additional congestion and higher costs for network reinforcement, undermining the original purpose of battery collocation. Lastly, the standards for observability and controllability (such as IEC 61850) are not uniformly required for EV charging and storage systems. This means that DSOs cannot integrate these assets into SCADA systems for real-time supervision, which raises operational risks.

4. Regulatory challenges of battery collocation:

Today the regulatory landscape for battery collocation remains unclear, creating significant uncertainty for investors and operators. One of the main gaps lies in the absence of specific provisions addressing how BESS integrated with EV charging infrastructure should be metered and billed, making the business case for collocated systems less attractive. Without harmonized rules, operators face uncertainty regarding network charges, tariffs, and the legal framework for providing flexibility or ancillary services.

Beyond the existing issues around metering, billing, and connection processes, DSOs face critical regulatory challenges concerning grid observability, controllability, and security compliance when batteries are connected with EV charging infrastructure. These challenges stem from the fact that DSOs retain legal responsibility for maintaining grid reliability and security, yet regulatory frameworks do not provide clear rules or tools to manage the operational implications of such hybrid assets. In many cases, DSOs only know the contracted grid capacity (e.g., 100 kVA), not the actual power exchange that can occur due to the battery discharging (e.g., up to 300 kW behind the meter). This lack of visibility increases operational risks, as DSOs cannot accurately predict loading conditions or react to contingencies. Regulatory frameworks under the Electricity Directive and Network Codes (such as NC DCC and NC CACM) encourage transparency but do not impose detailed obligations for observability of behind-the-meter storage.

Last but not least, under security and system operation principles, DSOs must ensure they can always maintain safe and reliable operation of the grid. Yet, with battery collocation, DSOs often have no direct control or curtailment rights over the operation of the battery or associated charging infrastructure. In an emergency scenario (such as the inverter malfunction) DSOs may lack the legal or technical capability to remotely limit battery discharge or isolate the system quickly and might not be able to always secure the reliable operation of the grid as it is legally required.

5. Key Recommendations for a grid friendly scale up of battery collocation

Establish a clear regulatory framework for battery collocation

- Clarify grid connection requirements, metering and billing rules.
- Define operational roles for DSOs & CPOs.

Establish certification and compliance requirements

- Ensure that installed batteries meet EU level safety standards.
- Include built-in mechanisms to safeguard the grid in case of malfunctions.

Ensure observability & controllability

- Define data sharing processes for collocated assets to ensure minimum observability for DSOs.
- Grant DSOs last-resort curtailment or disconnection rights in case of a system security threat.

Incentivize Grid-Friendly Operation

- Prevent charging/discharging strategies driven solely by market prices, which can worsen congestion.
- This can be done by monetary incentives (time, dynamic grid tariffs); Guardrails (limits definition in Flexible connection agreements or Targeted interventions (ad-hoc redispatch).

Create local flexibility markets

- Enable batteries to participate in local congestion management and ancillary services, creating additional revenue streams for operators.

Foster cooperation between stakeholders

- Create dedicated forums for TSOs, DSOs, CPOs, and regulators to align on technical rules, interoperability standards, and market incentives that promote flexibility and grid security.
- Support the development of joint pilot projects to test real-world configurations, identify operational challenges, and co-develop technical and regulatory solutions needed for large-scale deployment.
- Promote early engagement between DSOs and CPOs during project planning to address grid connection requirements, safety considerations, and operational constraints efficiently.

DSOs remain committed to collaborating with CPOs and other stakeholders to accelerate the deployment of battery collocation solutions. This collective effort will contribute to the broader mission of enabling a robust, future-ready EV charging network that supports the transition to zero-emission transport across Europe.