reev Smart Guide

# Grid integration for heavy-duty electric vehicles (EV) in the EU

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The transition to electric heavy-duty vehicles (HDVs) is a key part of the European Union's (EU) strategy to reduce greenhouse gas emissions and achieve climate neutrality by 2050. However, the high energy demand for charging these vehicles poses significant challenges for national electricity grids, especially during peak times.

This white paper highlights the challenges of grid integration for heavy-duty EV charging infrastructure within the EU. It highlights solutions such as smart grid technologies, energy storage systems and the integration of renewable energy. It also positions reev as a key player in addressing these challenges through advanced energy management and sustainable charging solutions.

## 1. Introduction: The increasing demand for heavy-duty EV charging infrastructure in the EU

The European heavy-duty transport sector is undergoing rapid change due to ambitious EU regulations to reduce emissions. According to the European Environment Agency (EEA), heavy-duty vehicles (HDVs) caused 27% of total CO2 emissions from road transport in the EU in 2021, although they only account for 2% of vehicles on the roads (EEA, 2022).

To counteract this, the European Commission has introduced new CO2 emission standards that stipulate a 90% reduction in emissions from new lorries and buses by 2040 (EC, 2023). The transition to electric heavy goods vehicles is central to achieving these targets. The EU predicts that at least 50% of new trucks sold will be electric by 2030 (ACEA, 2023). However, the rapid electrification of this sector poses significant challenges for grid integration.

## 2. The challenge: heavy-duty EV charging and the impact on the power grid

Charging heavy-duty EVs requires considerably more electricity than charging cars, which can lead to potential grid congestion. The key challenges are

- **High power requirement:**
  Fast charging a single electric lorry at 350 kW consumes as much electricity as 100 households (T&E, 2023).

- **Simultaneous charging:**
  Fleet depots and logistics hubs often require several high-power chargers at the same time, generating peak loads of over 10 MW per site.

- **Cost of grid upgrades:**
  The European Investment Bank estimates that upgrading the grid infrastructure to support HDV electrification will require investments of €30-50 billion by 2035 (EIB, 2022).

## 3. Intelligent grid solutions: Control of heavy-duty EV charging requirements

A smart grid uses digital communication, real-time monitoring and AI-supported load control to optimise power distribution and avoid grid overloads.

### 3.1 Dynamic load management

Dynamic load management distributes the available grid power to several charging points and prioritises charging based on timetables and grid capacities. Advantages:

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- 20-40 % reduction in peak load, avoiding expensive grid upgrades.
- Up to 30 % savings in electricity costs by charging during off-peak times (Fraunhofer ISI, 2023).

reev enables energy management through a cloud-based charging platform that ensures efficient power distribution for fleet operators.

### 3.2 Real-time monitoring and smart charging

Real-time monitoring can ensure grid stability by predicting charging requirements and dynamically adjusting power allocation.

The reev platform enables operators to monitor energy consumption, integrate renewable energies and use demand response programmes to reduce the load on the grid.

## 4. Energy storage solutions: Equalising grid load

Energy storage systems (ESS) are crucial for decoupling charging requirements from direct grid consumption by storing surplus energy and releasing it at peak demand.

### 4.1 On-site battery storage

- Lithium-ion battery storage systems can reduce the peak load at busy locations by 40-50 % ( BloombergNEF, 2023 ).
- Battery storage systems enable operators to take advantage of more favourable electricity tariffs, which reduces operating costs.

**reev integrates battery storage solutions into the charging infrastructure to optimise energy consumption and minimise the load on the grid.**

## 5. Integration of renewable energies: Enabling sustainable charging

The combination of renewable energies with heavy-duty EV charging stations reduces the CO2 footprint and dependence on fossil energy sources.

### 5.1 Solar and wind power for charging infrastructure

- PV systems on depot roofs can cover up to 20-40 % of a site's energy requirements (IRENA, 2023).
- Wind turbines at charging hubs enable an 80% reduction in CO2 compared to grid-based energy.

**reev facilitates the integration of solar, wind and grid power with its charging solution and ensures sustainable, cost-efficient processes.**

# 6. reev: Holistic solutions for heavy-duty EV charging

**The electrification of heavy goods transport is crucial for the EU's climate targets, but poses major challenges for the network infrastructure. reev offers:**

- Intelligent energy management to optimise charging processes.
- Integration of renewable energies to reduce emissions.
- Energy storage solutions to relieve the load on the grids.
- Dynamic load management to reduce costs.

## Conclusion:

The electrification of heavy goods transport is one of the biggest challenges facing the European energy transition. Without intelligent solutions, there is a risk of grid congestion, rising electricity costs and significant infrastructure investments. The combination of load management, energy storage and renewable energies is essential in order to make the ramp-up of electromobility in the heavy goods vehicle sector economical and sustainable.

With its cloud-based platform, reev offers a comprehensive solution that enables efficient grid integration. Through intelligent control, predictive energy management strategies and the seamless integration of renewable energies, reev helps fleet operators and logistics companies to cut costs, reduce emissions and future-proof their operations.

**Sources.**
- European Environment Agency (EEA, 2022)
- European Commission (EC, 2023)
- ACEA (2023)
- Transport & Environment (T&E, 2023)
- European Investment Bank (EIB, 2022)
- Fraunhofer ISI (2023)
- BloombergNEF (2023)
- International Renewable Energy Agency (IRENA, 2023)

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