Case Study: Microgrid for Logistic Centers

2025

This report from **Ampcontrol** explores how logistics and distribution centers leverage solar, batteries, and EV charging to electrify their fleets. Similar can be applied for bus depots, last-mile centers, and public charging hubs.

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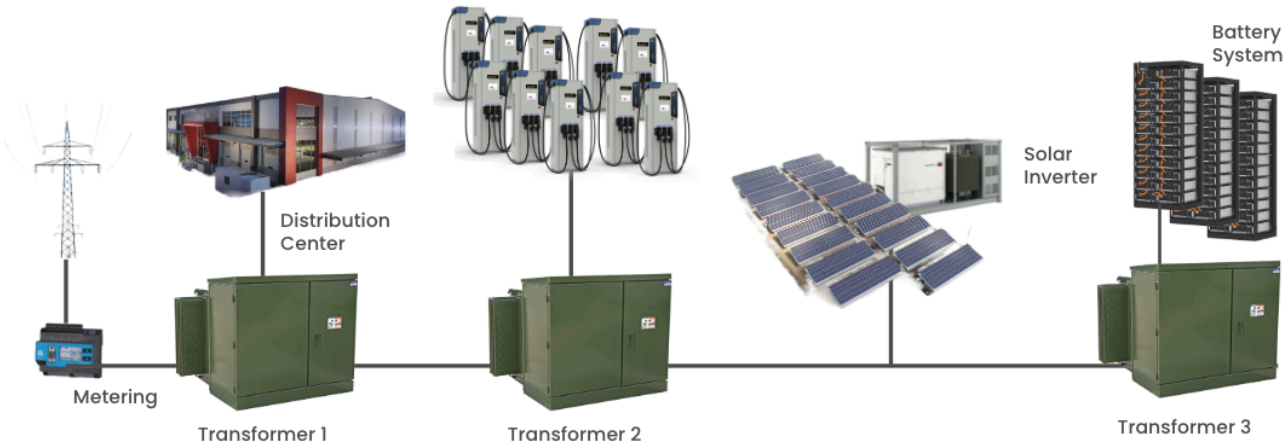
Overview

Ampcontrol collaborated with a major logistics company to electrify several distribution centers across Europe using Ampcontrol's charger and energy management platform. This document describes the commissioning of one site in the Netherlands.

Site Overview

Type	Distribution center for consumer and retail products
Number of trucks	~100 trucks daily (outbound)
Number of chargers	10
Charger brand	ABB
Charger power	360 kW each
Energy assets	Solar (1MW) and battery (500 kWh)
Building load	~ 1MW



Energy assets at the distribution center

Challenge

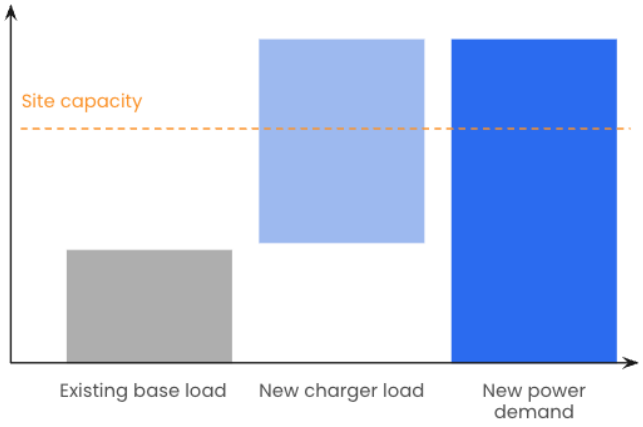
The company operates multiple distribution centers. Trucks deliver goods to retail centers, typically operating in two or more shifts. A key characteristic of the operation is that the trucks are not owned by the company but are operated by various 3PLs (Third-Party Logistics providers). When the company began the process of electrifying its first sites, it encountered two major hurdles.

1) High Power Demand and Limited Grid Availability

The new electric trucks have substantial energy requirements (averaging 280 kWh per workday). The warehouse already consumes a significant amount of load for cooling and machinery, such as forklifts. Using the 10 DCFC chargers at full capacity would result in an additional high load. Meanwhile, the solar generation and the new battery system are not integrated into the charging infrastructure.

Building and machines	500kW
EV Chargers	360 kW (3.600 kW in total)
Solar generation	~55000kW peak
Battery	1.000 kW / 1.000 kWh
Grid capacity	2.200 kW

The additional load from the EV chargers exceeds the site's current capacity by a significant margin.

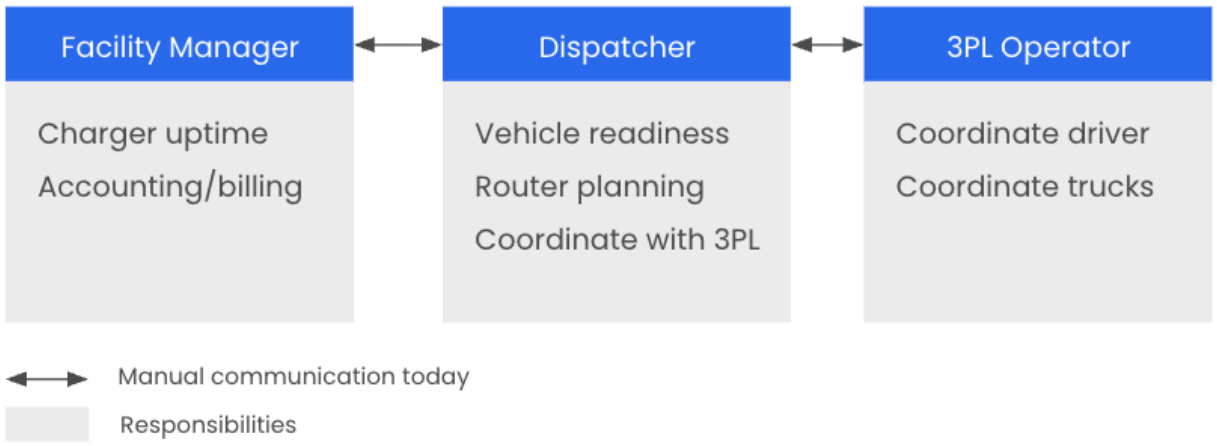


Additional load from EV chargers is not supported by the site

2) More Trucks than Chargers

The second major hurdle is a logistical problem stemming from the fleet size exceeding the charging infrastructure capacity. The distribution center currently uses 20 electric trucks for distribution and plans to add another 10 in the coming year, while it has only 10 chargers. Since the external 3PLs operate most trucks, dispatchers face significant difficulties planning future charging sessions and communicating the specific charging slots to their 3PL partners. Small scheduling mistakes lead to **long wait times for drivers**, meaning an electric truck driver has to wait for an available charger.

This bottleneck in the **charging process slows overall operations** and drives up costs.



Communication and manual work before the project

Solution

Ampcontrol and the distributor established three key objectives:

- to overcome grid constraints
- minimize driver wait time
- and maximize energy cost savings.

Step 1: Microgrid to leverage solar and batteries

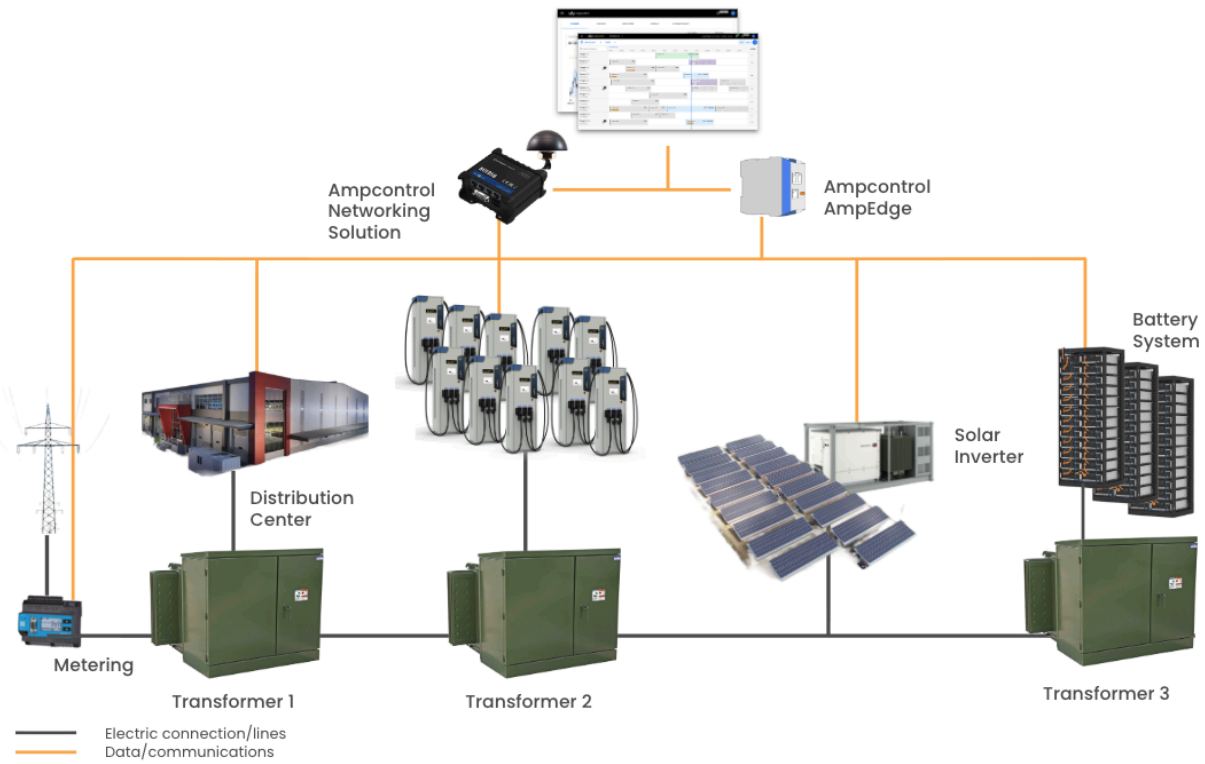
Ampcontrol implemented a local microgrid setup utilizing its proprietary hardware to manage energy flow across the site.

Asset Integration: Ampcontrol connected all energy assets locally using the Ampcontrol AmpEdge controller.

Networking and Connectivity: Ampcontrol deployed a secure networking solution with dual SIM cards and a router to ensure a reliable data connection.

Protocols used for integration:

EV Charger	OCPP 1.6J
Battery & solar	Modbus TCP/IP
Meters	Modbus TCP/IP



Energy management integration and communication

The AmpEdge controller has the capability to operate entirely without internet if necessary. However, when connected via the provided internet solution, it links to the Ampcontrol Cloud for monitoring and additional optimization functionalities.

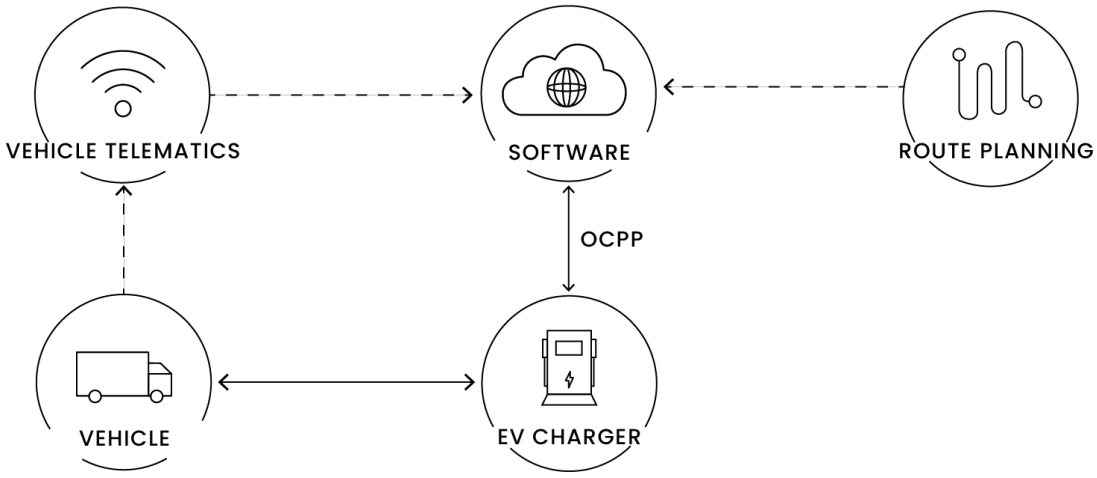
Step 2: Integrations of TMS and vehicle telematics

The optimization must account for power requirements and fleet operation requirements (e.g., routes and departure times). To optimize charging based on operational needs, the Ampcontrol Cloud was integrated with the fleet's existing data systems:

TMS Integration: The platform integrated with the existing Transportation Management System (TMS).

Telematics Integration: It integrated with Geotab, the existing telematic system used by the trucks.

Real-Time Data: Through the TMS and telematic data, Ampcontrol's platform received real-time updates on crucial operational information, including planned routes, truck location, and the battery State of Charge (SoC).



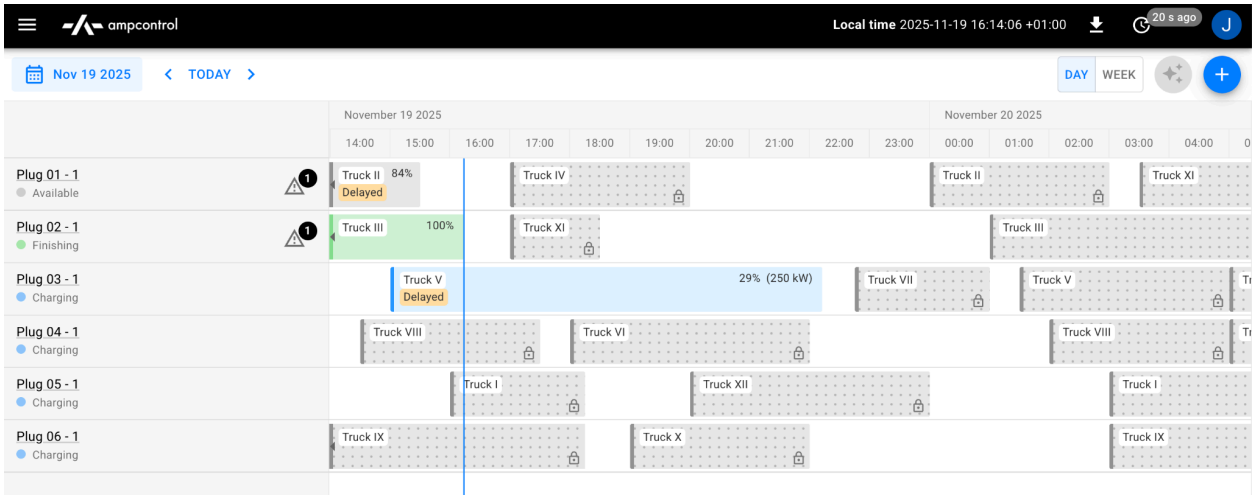
Smart charging software integrated with vehicle and route data

The software leverages the integrated data to automate and optimize the charging process.

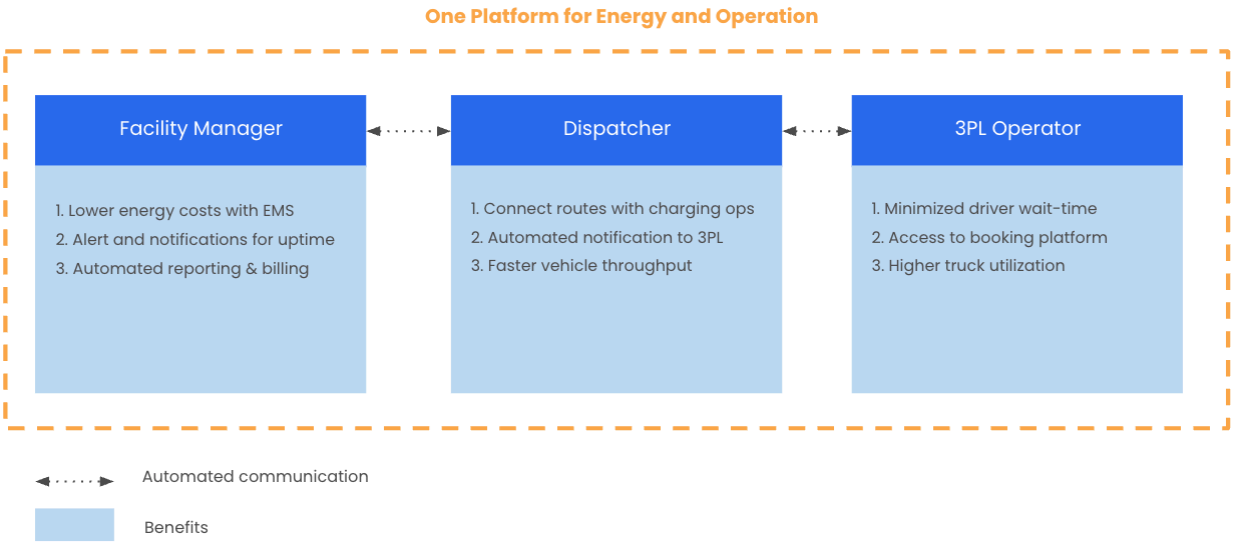
Advance Scheduling: Ampcontrol's Autoscheduler automatically takes the planned routes from the TMS and schedules future charging sessions 2-3 days in advance.

Reoptimization: A few hours before a vehicle is scheduled to return to the distribution center, the charging reservations are reoptimized to ensure an accurate plan based on the latest data.

Automated Notifications: The Autoscheduler also sends automated notifications to the 3PLs, enabling them to plan the driver's breaks and other activities around the scheduled charging slots.



Ampcontrol view for dispatcher and site operator (future charging session bookings)



Benefits by key role, resulting from platform integration

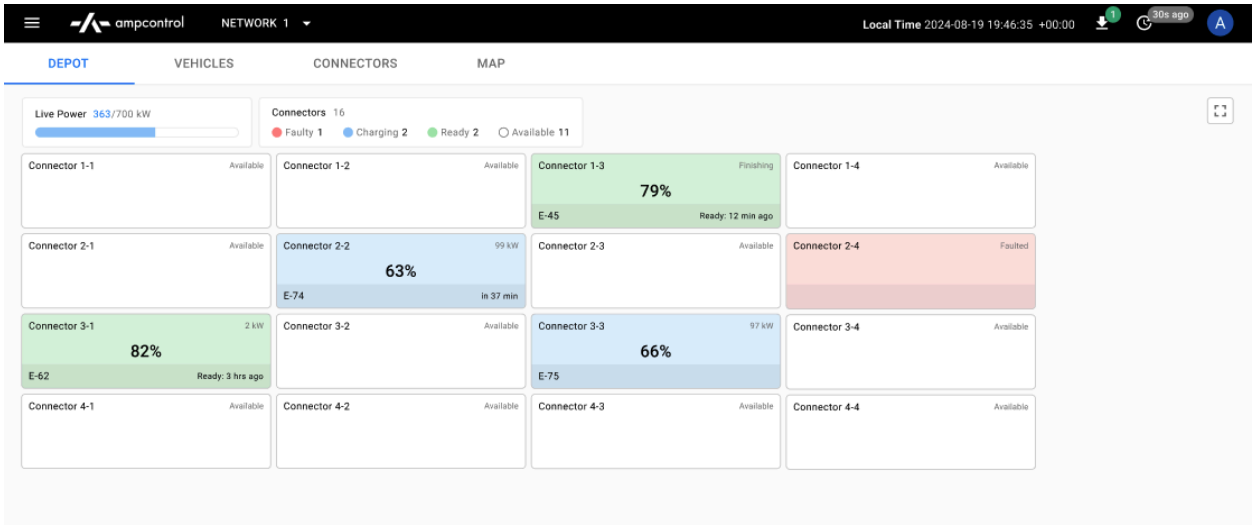
Benefits

The main objectives were to overcome grid constraints, minimize driver wait time, and maximize energy cost savings.

Driver wait time reduced by 36%

The smart charging solution delivered significant operational improvements, most notably a **36% reduction in average driver wait time**. The deployment of the Autoscheduler allowed dispatchers to maintain their normal planning process, similar to combustion vehicles, by automatically receiving planned routes, scheduling future charging sessions, and sending email notifications to the 3PLs. This process consistency avoided major changes to operations and ensured drivers did not arrive at a fully occupied charging hub, as the charger was reserved for a specific vehicle and driver. This ultimately reduced wait times and generated positive feedback from the drivers.

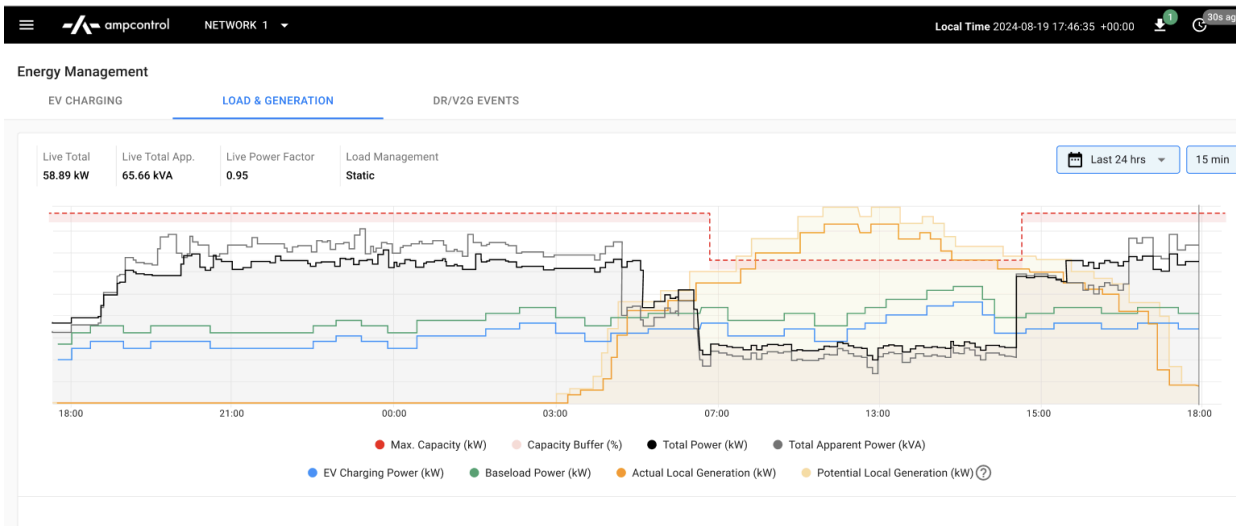
The drivers also receive notifications and can monitor the charging progress on a large screen.



Charging speed increased by 19% at lower costs with solar power

By dynamically controlling the chargers, battery, and solar inverter and allowing the battery to be used during peak periods, the solution achieved a 19% increase in average charging speed per session. The main contributor was that the charger's max speed was dynamically controlled based on building load and site generation. This also allows more vehicles per site due to faster throughput.

Furthermore, integrating the battery and trucks **increased on-site solar energy use by approximately 15%**, directly reducing monthly energy costs. The dynamic integration of the battery and chargers enabled a higher charging speed, allowing the depot to successfully charge more vehicles daily.



About Ampcontrol

Ampcontrol is a leading provider of energy management and EV charging optimization solutions, designed to streamline the deployment and operation of charging infrastructure. Its innovative software and hardware solutions cater to diverse requirements, enabling seamless integration, real-time monitoring, and intelligent management of EV charging networks. Ampcontrol's Energy Management system optimizes energy usage across diverse sites, accommodating unique depot constraints such as transformers, grid connections, energy tariffs, and vehicle departure schedules. The system enables real-time monitoring and optimization of both chargers and vehicles, integrating seamlessly with OEM telematics systems or third-party telematics devices, requiring no additional hardware installation.

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