PANION
Charge planning & management for electric trucks

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Co-funded by UK Government

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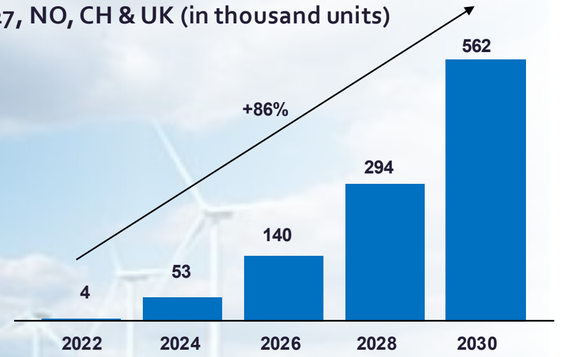
Road freight transportation turns electric

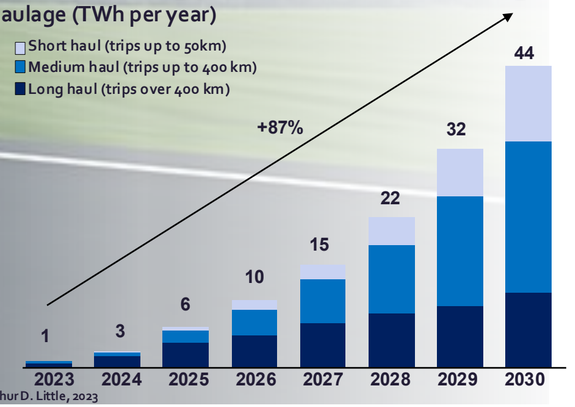
E-truck fleet forecast

EU27, NO, CH & UK (in thousand units)



Needed energy for e-truck hauling

By haulage (TWh per year)



Source: Arthur D. Little, 2023

However, existing operating models will be challenged

- Time for charging needs to be fitted into sometimes tight operational schedule
- Managing available range to be sufficient for each tour
- Managing energy cost & power consumption regarding required utility contracts and infrastructure*
- Vehicle-to-Tour assignment: coordination with charging and parking
- Pre-condition planning: needs to be accounted for in charge plan

* Power available on site is typically constraint to < 1MW

PANION seamlessly integrates the charging system into business operations

Business Operations

The Charging System

Schedules

Vehicles

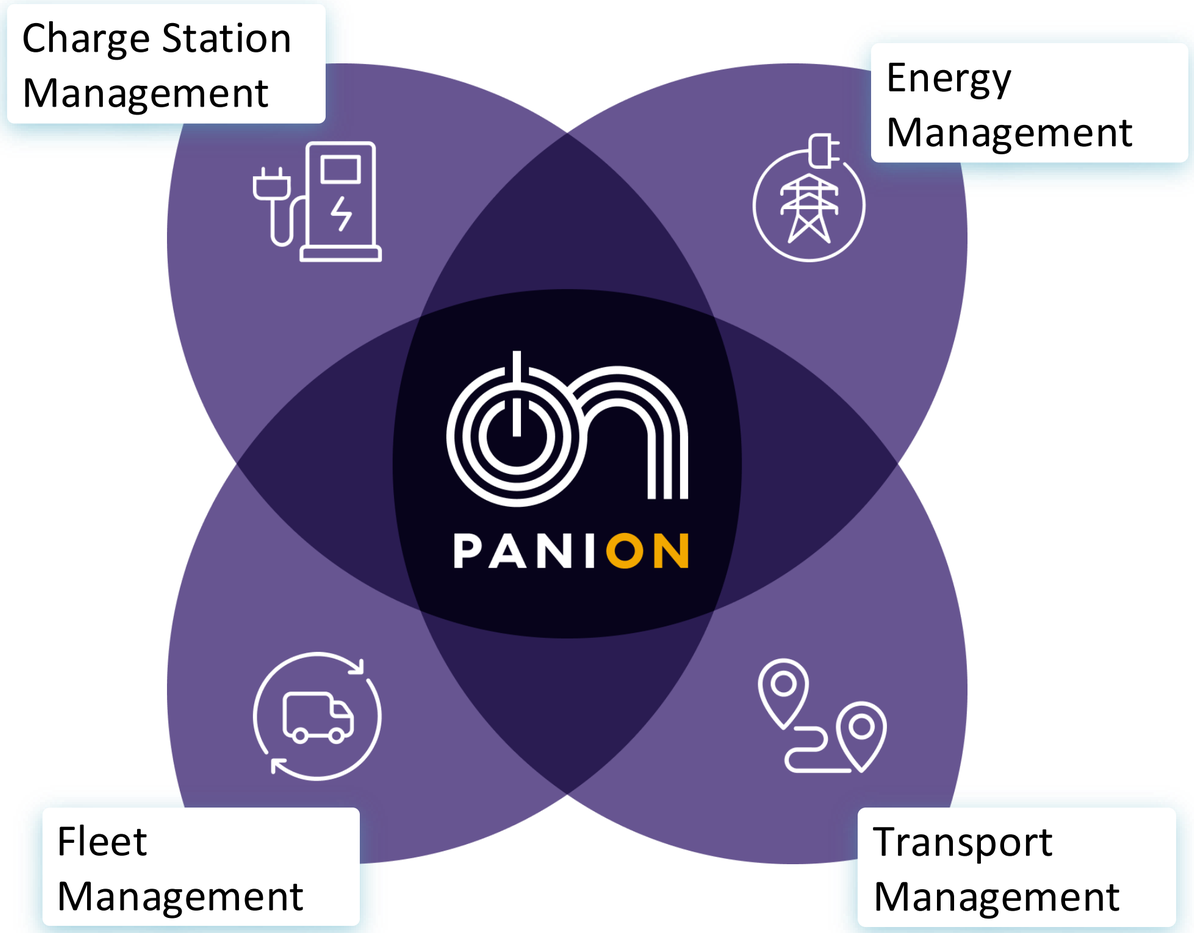
Drivers

Energy tariff

Available power

Available chargers

Maintaining the continuity of the core logistics business requires integration and contextualization



Unique added value output

- Dynamic & responsive charge plan per truck
- Charging cost per truck per time (for subcon charge back) based on actual market pricing
- Power consumption & energy demand forecast

First Priority: Secure business operations
Second Priority: Energy cost efficiency

PANION: Dynamic Reservation, Execution Management & Optimization of Charging for Commercial Fleets

- **Reservation** for charging sessions for commercial vehicles and trucks via a web UI or a mobile app
- **Estimation of energy consumption** for each vehicle's upcoming tours based on historic tour information, routing information, payload etc. using machine learning and artificial intelligence
- **Dynamic updating of the charging sessions** based on realities of the road for each individual vehicle via real-time connectivity to the vehicle
- **Assignment of a specific charge point for each individual vehicle** considering the available network capacity, required battery energy level and departure time
- Real-time **management and control of the charging profile** to secure on-time departure with the right level of energy on the battery
- **Automatic vehicle recognition**, authorization, recording of all relevant session information to generate weekly, monthly, quarterly charge cost reports for each individual vehicle for partner/subcontractor/visitor invoicing (considering dynamic market prices as applicable)
- **Real-time communication** of charging plans, their updates and associated tasks to all stakeholders (drivers, transport managers etc.)

Next ETRUCK

Scandinavia’s industry leading grocery distributor relies on PANION

NorgesGruppen ASA / ASKO NORGE AS
700 trucks, 18 depots

18 distribution centers with 1/2/3-shift, multi-tour grocery deliveries using own, sub-contracted, and 3rd party fleet

200+ e-trucks (swap bodies, semi-trailers, gate loading), multiple OEMs, native telemetry, 3rd party TMS

80 chargers with 200+ outlets, 8 models from 3 OEMs

50% customer orders fulfilled with e-trucks	66% e-truck shifts per day
50% infrastructure utilization	30% cost of charging

OEM: Original Equipment Manufacturer | TMS: Transportation Management System

"The PANION team gained deep understanding of our operations. PANION Charging helps us maintain operational excellence in spite of the additional challenges associated with truck battery charging. It automatically coordinates battery charging with our daily operations. We now feel comfortable to further continue the ramp up of our fleet of electric trucks leading to a fossil free transportation by 2026. The coming 3 years(24->26) we will increase our fleet from 100 to approx. 500 trucks"

Svein Sollie,
Director Transport ASKO NORGE AS

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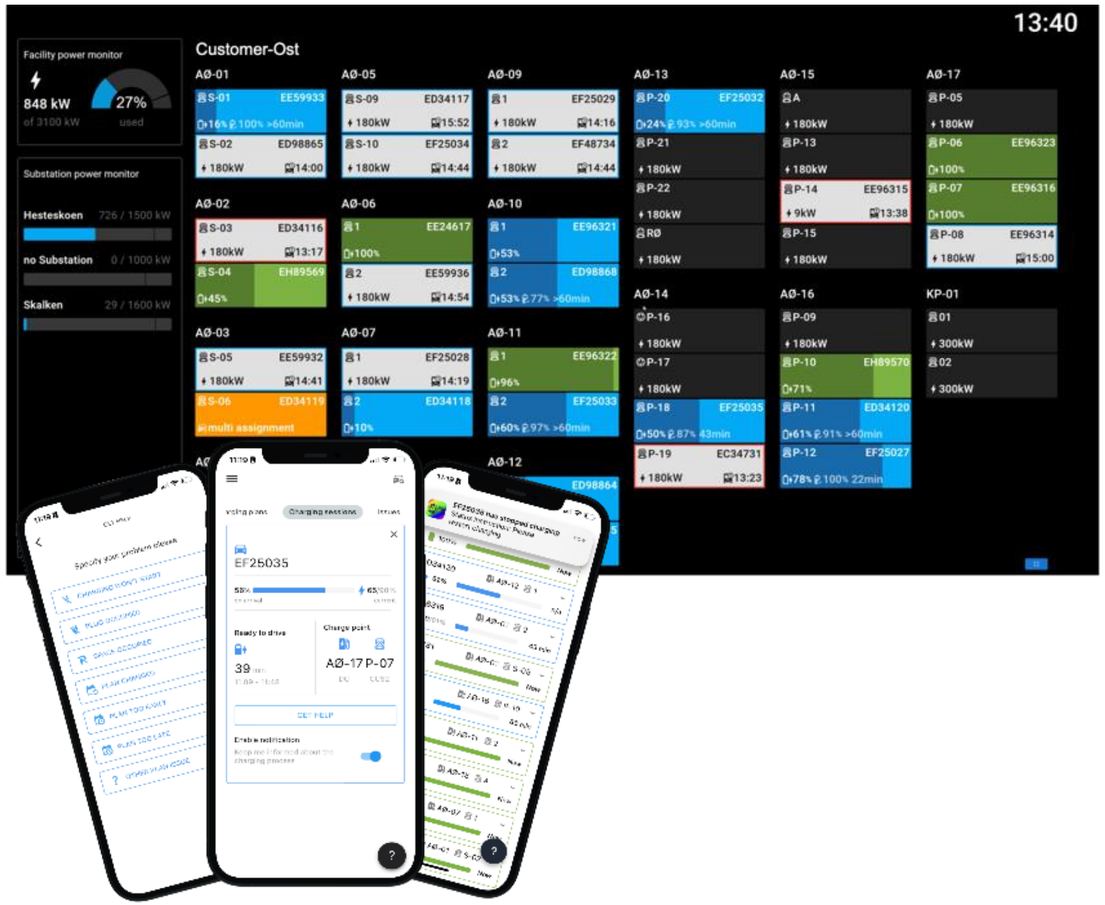
PANION Charging securing operability of the fleet

PANION Monitoring: full transparency allows for better and more timely communication and problem response



What it is:

- provide remote operational access to charger (**OCPP backend)**
- **display real-time** current **charger activity** and performance
- link **vehicle data contextualized** → 360° perspective
- **expose** information on large monitoring **screens**, **mobile app**, web-interface as well as feed-integration into existing platforms
- provide **Ready-to-Drive** indicator
- enable charge session **alerts** and response management
- furnish charge session **Reporting**

Sample Case:

charging status displays in driver lounges and transport or dispatch offices

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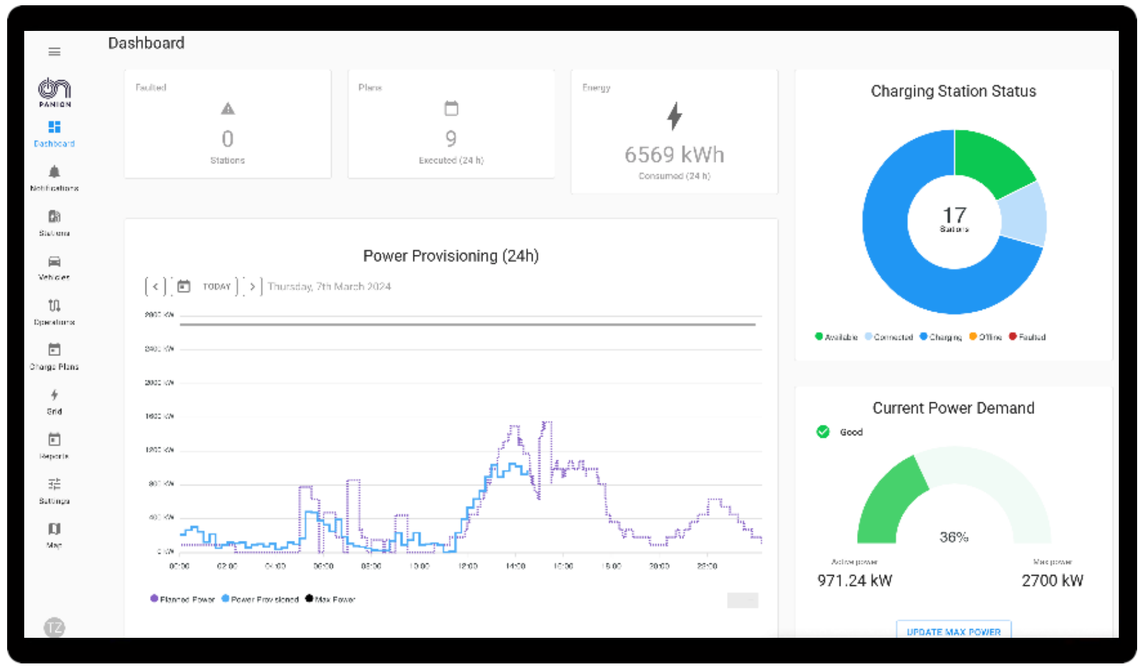
OCPP: Open Charge Point Protocol

PANION Power Management: hardware capability enhancement through smart software



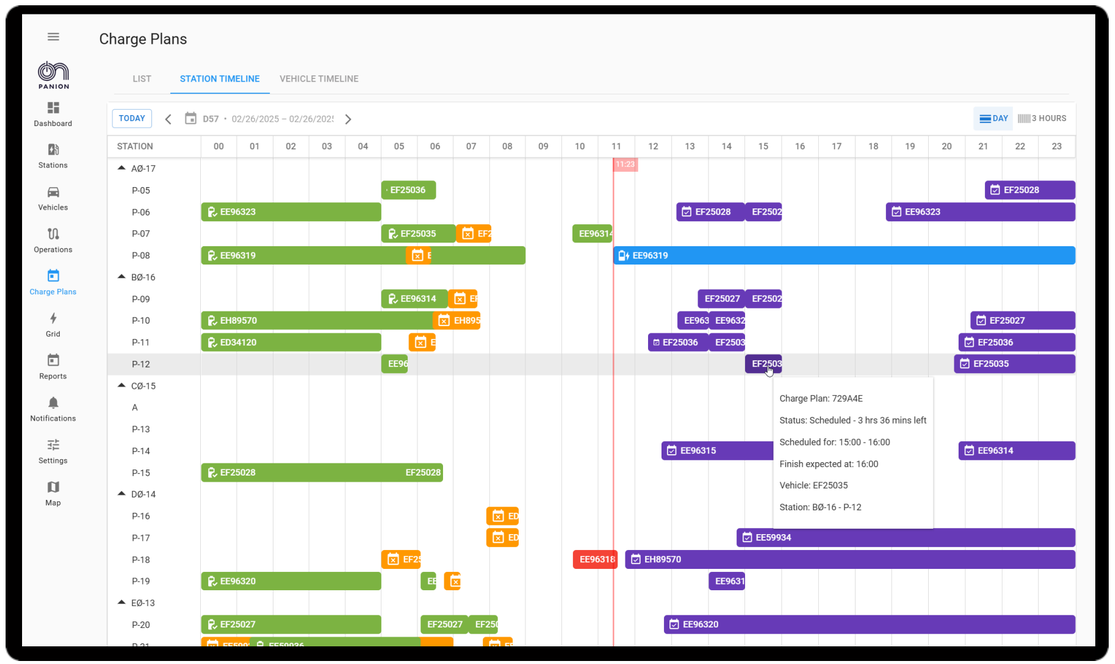
What it is:

- **allocating power per charger outlet** following a schedule (e.g., toggling between 90 kW or 180 kW – manually or automated)
- **allocating power** dynamically **per truck** based on operational needs (requires PANION Charging)
- **controlling power** across transformer substation hierarchies
- **protecting** and monitoring **grid** limits
- starting and stopping of charge sessions remotely

Sample Case:

fast charging during day shift, economic charging throughout the night

PANION Charging: real-time integration of charging and energy operations into the transportation schedule



What it is:

- reconciling **real-time information** from **vehicles** (incl. GPS, SOC), **charging infrastructure, energy grid** and **TMS**
- **predicting** needed **energy** and **target SOC** per vehicle per trip
- **planning / scheduling** and constant **updating** of **charging activities, resources** and **timing** for every vehicle
- **communicating** plans, updates and to-dos to all relevant **stakeholders** (e.g., drivers, dispatchers)

Sample Case:

short turn-around-cycles in grocery distribution

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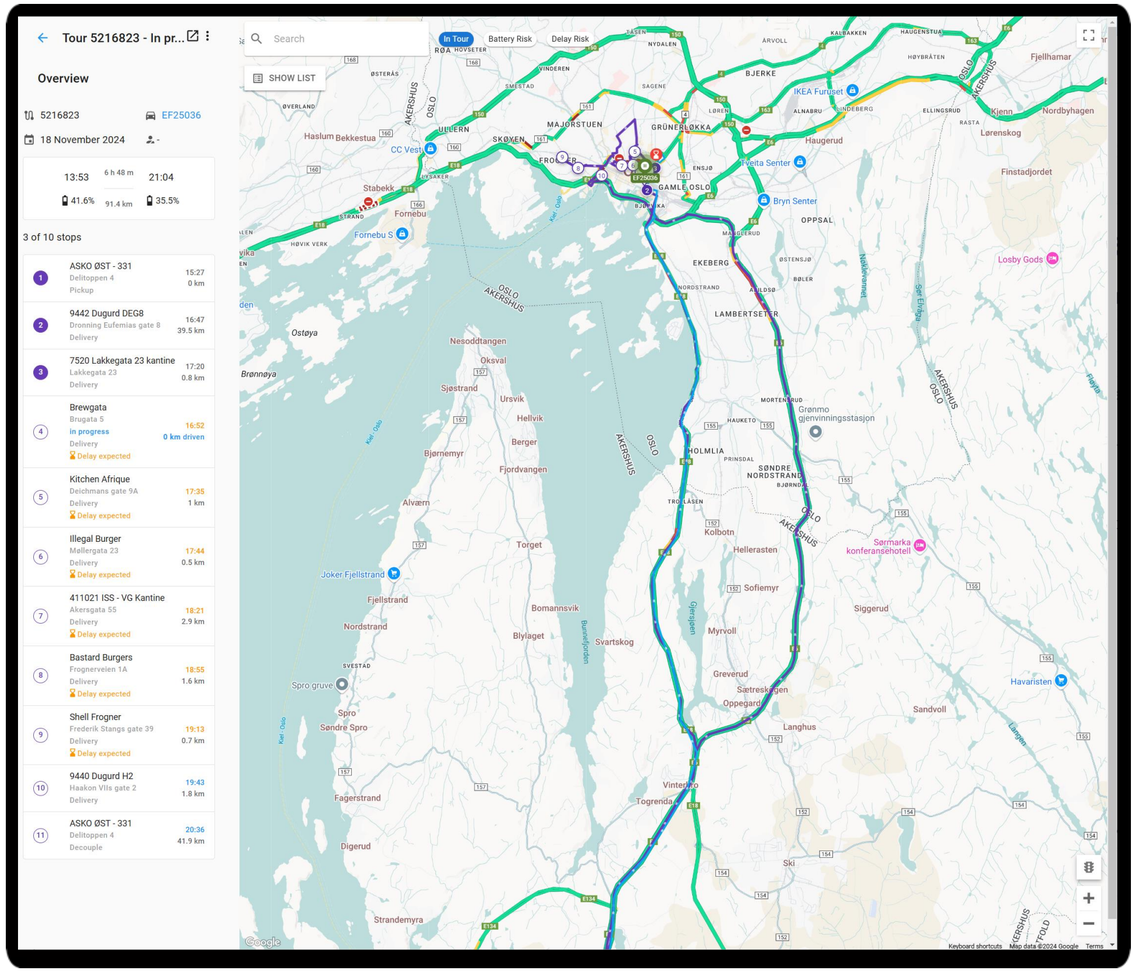
GPS: Global Positioning System | SOC: State of Charge | TMS: Transportation Management System

PANION Tours: keeping the eyes on the vehicles - and the vehicles on the road



What it is:

- **monitoring** geo-location, SOC and traffic for every vehicle in real time
- **recalculating** ETA and expected SOC constantly – adjusting affected charge plans and triggering communication updates accordingly
- **helping** the fleet manager to devote time and attention to **business operations** and customer service
- generating **recommendations** to change the tour and resolving the charge shortages of the EV (opportunity charging)

Sample Case:

manage complex grocery logistics operations by visualizing tours and related risks, adopting proven user-friendly patterns

SOC: State of Charge | ETA: Estimated Time of Arrival | EV: Electric Vehicle

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