Green Transport Delta

Electrification

WP 4 project finalization summary

released for publication

21 november 2024

BRAINPORT DEVELOPMENT
economische ontwikkelingsmaatschappij

rai AUTOMOTIVE INDUSTRY NL

Battery Competence Center

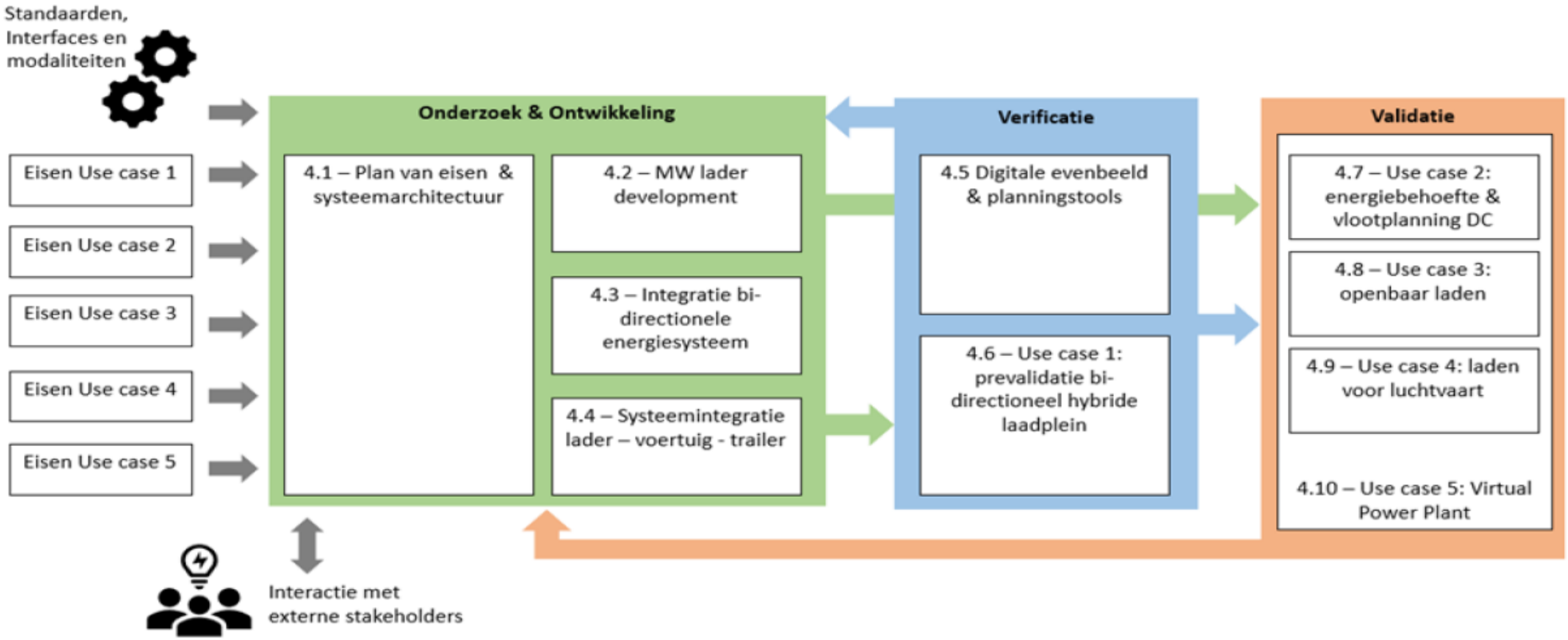
Agenda

- Work pack 4 introduction
- MW charging requirements
- Products design and development
- Verification
- Use-case implementation and validation highlights

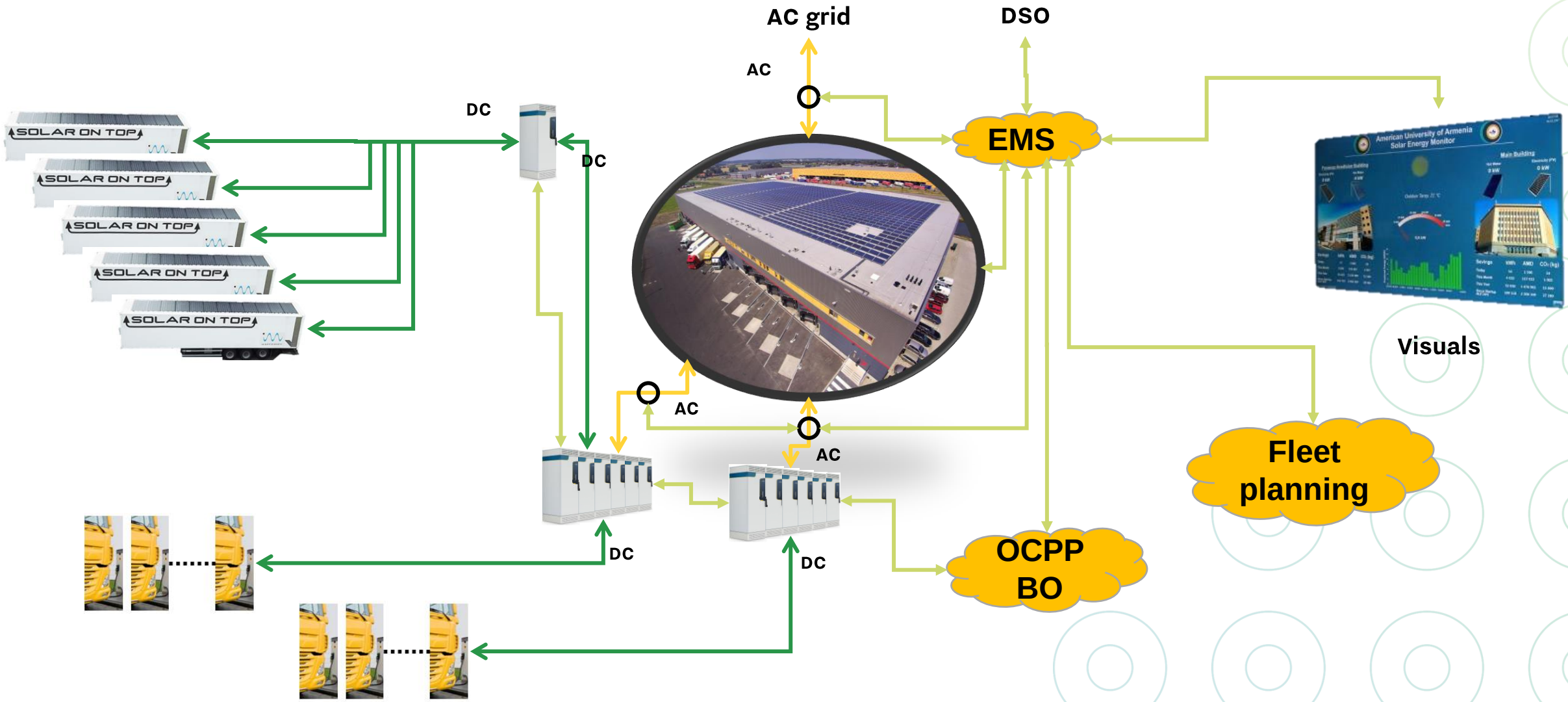
Time	Topic	Presented by
11:00 – 11:15	General opening/reflection	Steven/Freek
11:15 – 11:45	WP 2	Roeland
11:45 – 12:15	WP 3	Henkjan
12:15 – 12:45	WP 4	Hans
12:45 – 13:45	Lunch	
13:45 – 14:15	WP 5	Tom
14:15 – 14:45	WP 6	Emma
14:45 – 15:00	Conclusion	Steven/Freek
15:00 – 15:15	Walking to demonstration area	
15:15 – 16:15	Demonstrations	(4 rounds parallel, each 15 minutes)
16:15 – 17:30	Drinks & networking	

Work pack 4 introduction

- Partners: 13 (Heliox lead)
- Tasks: 10
- Use-cases: 5



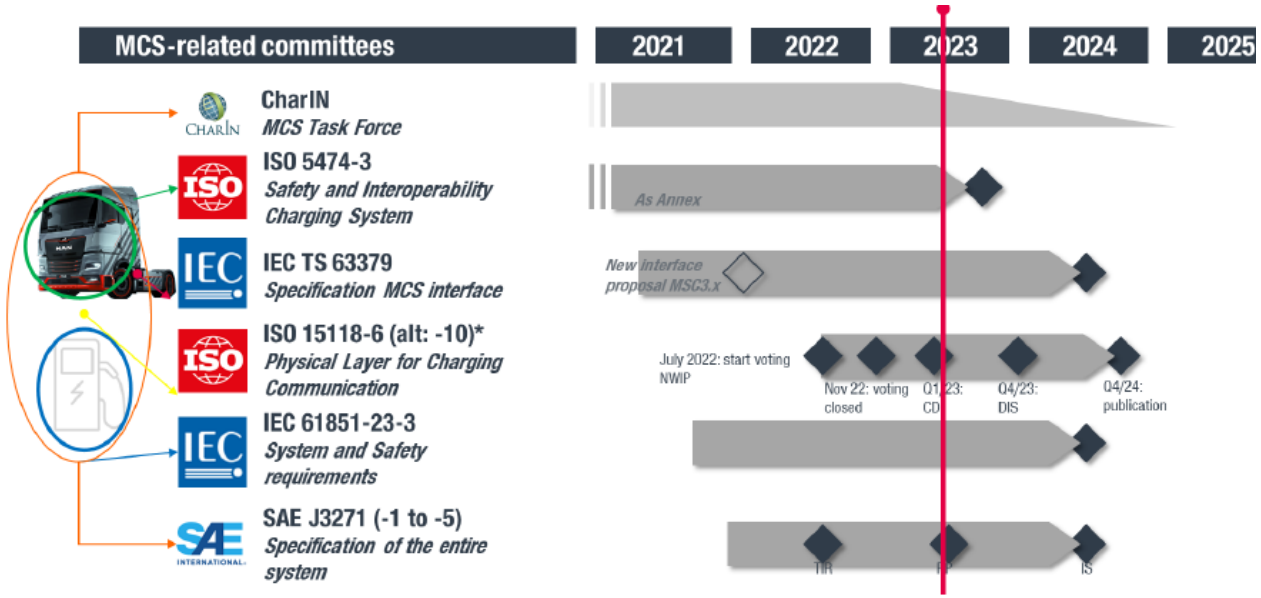
WP4 – goal: integrated scale-up infrastructure

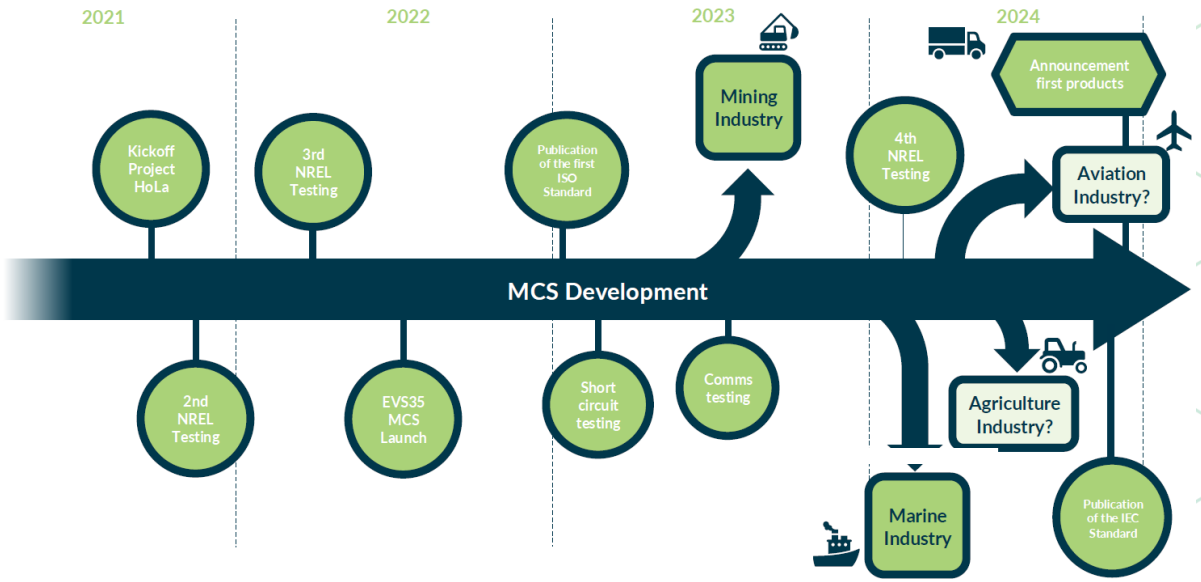


Task 4.1: MW charging requirements

(source: Huber+Suhner)

- MCS initiative by CharIn to develop world-wide MW standard
- Large industrial consortium (300+ companies and institutes)
- Different committees setting requirements for all parties





(source: CharIn GmbH)

Task 4.1: MW charging requirements

Overnight

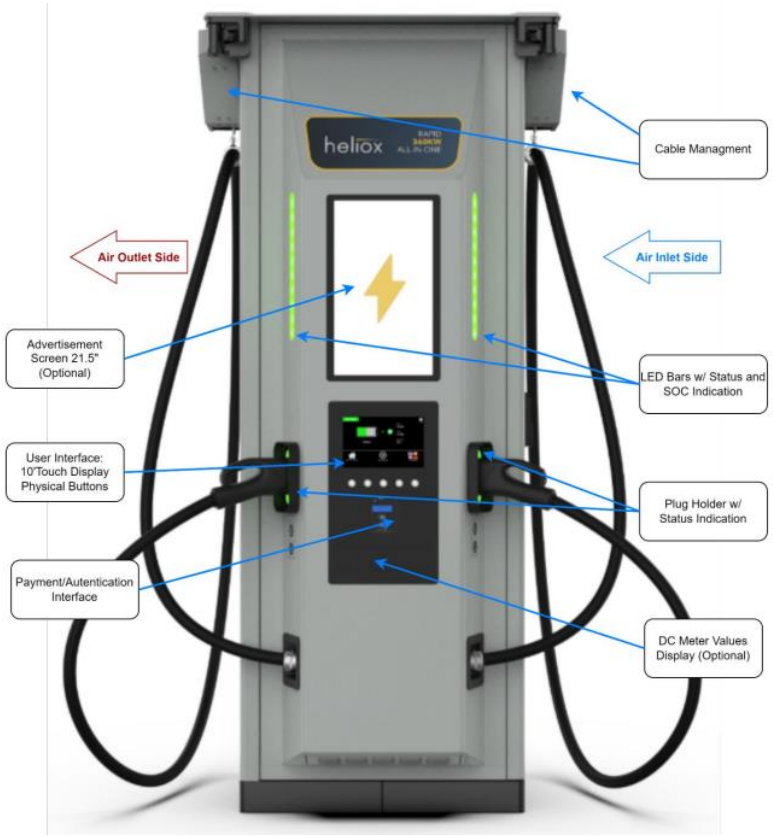
Destination

Task 4.2: Products R&D 1 MW MCS

- MW charger based on 2 skids that each deliver 540 kW, installed for use case 2
- 1x 1000 A MCS and 6x 250 A CCS

Task 4.2: Products R&D 360 kW CCS

- MW-scale charging distributed over 3 public chargers: all features in 1 cabinet
- Each public charger can supply 500 A to 1 or dual 250 A to 2 CCS cables



Task 4.2: Products R&D 1 MW MCS

- Verification in HKK @ TNO

- 540 kW power circulation between 2 Heliox chargers
- temperature swing of -30 to +50 °C tested
- elevated altitudes emulated of 1000 and 2000 m
- Confinement of cabinets and restricted air-flow tested
- 540 kW skid efficiency as function of ambient temperature tested

Task 4.4: Verification highlights

- Systemintegratie charger – truck – trailer

- The work done under Task 4.4 of the Green Transport Delta Electrification project, is majorly focused on integrating photovoltaic (PV) systems otherwise called the SolarOnTop (SOT), chargers, and electric vehicles to enable bi-directional energy exchange with the grid
- Our goal was to create a prototype system that could be deployed at the distribution centres, allowing truck-trailers equipped with SOT to both charge and discharge energy in a way that supports the grid.
- Major challenges in building and testing prototype system
  i. ISO 15118-20 in Smart bi-directional charging communication
  ii. High-voltage PV system integration
- We have not been able to reach our goal, due to the technical challenges. We decided to model the possibilities and chances of having SOT trailers connected to the grid
- The simulation results conclude a positive picture for bi-directional charging using solar energy and point to a strong business rationale for more funding for the development of bi-directional charging technologies

01 Identify sub tasks
02 Develop high-voltage SOT system
03 Ensure communication between Chargers with SOT system
04 Enable Bi-Directional Energy Exchange
05 Deploy at the distribution centre to achieve Grid Stability

Simulation of 5/10/15 truck-trailers and 5 stand-still trailers with SolarOnTop (SOT) system in a DC for 24 hours

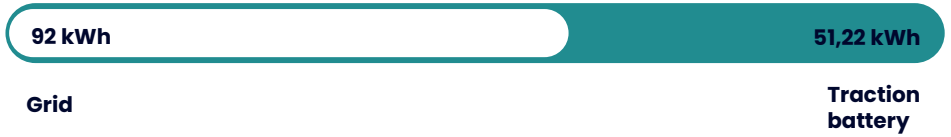
More vehicles yields more energy to the grid, and making profit from the business case requires efficient fleet planning and charging schedule management.

Major Results

143.22 kWh

Solar energy consumed from low-voltage (<60V) SolarOnTop

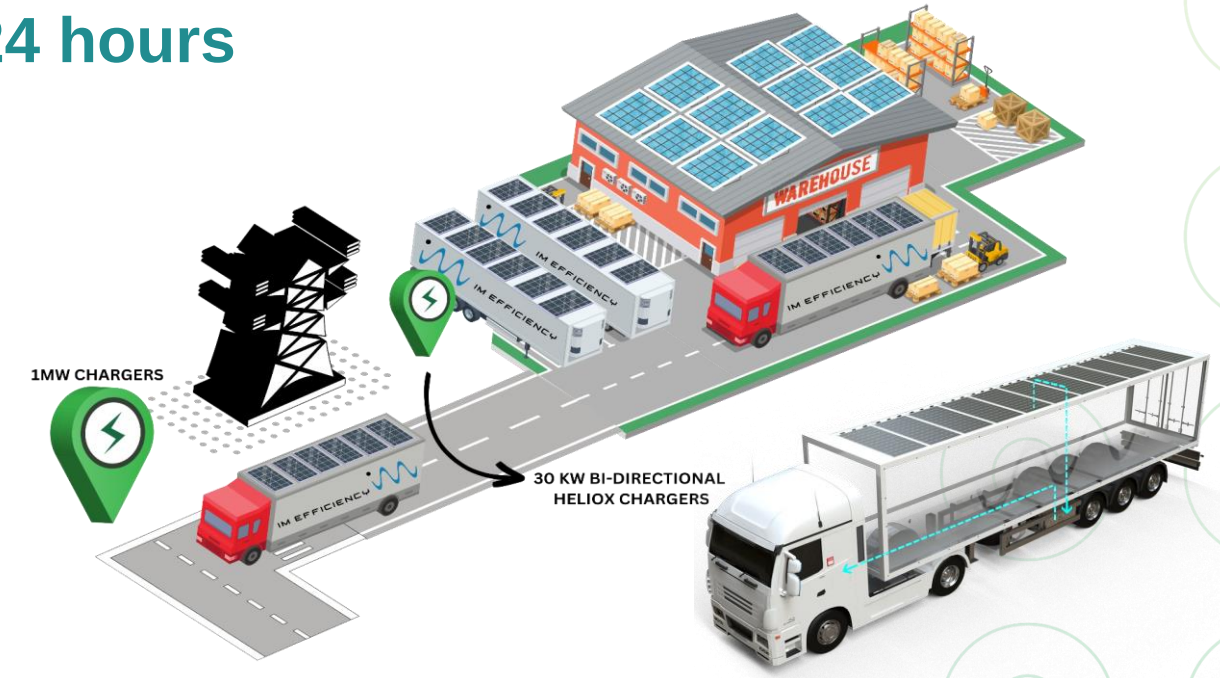
With real data from a low voltage SOT system, upto **143.22 kWh** of solar energy can be consumed in which **92 kWh** can be delivered back to the grid.

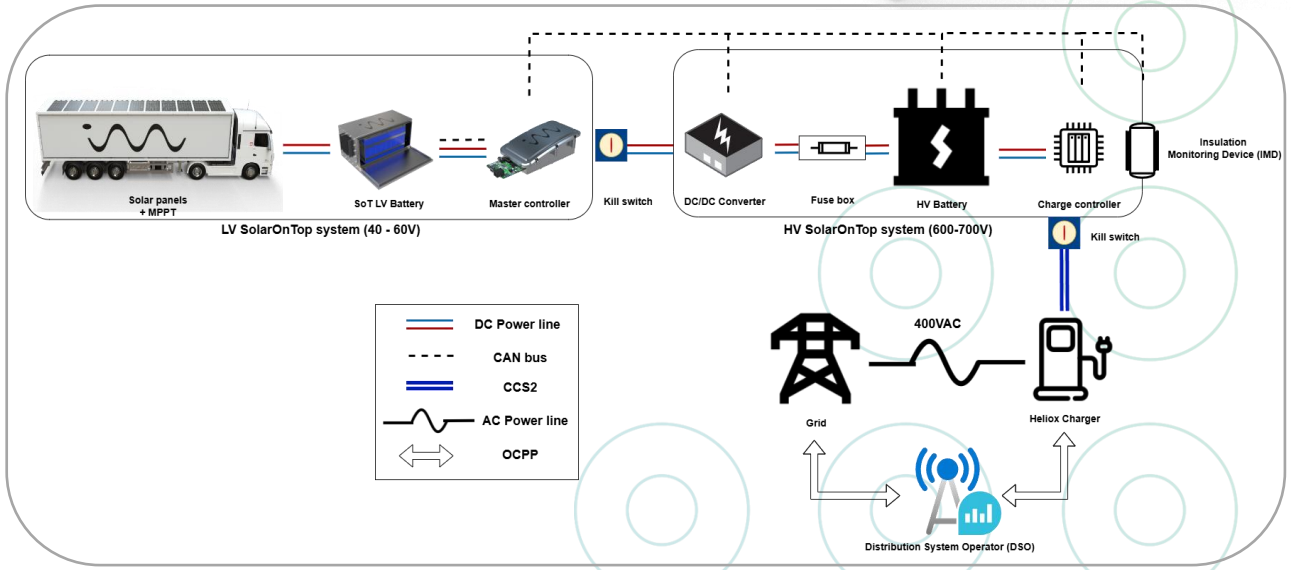


852 kWh

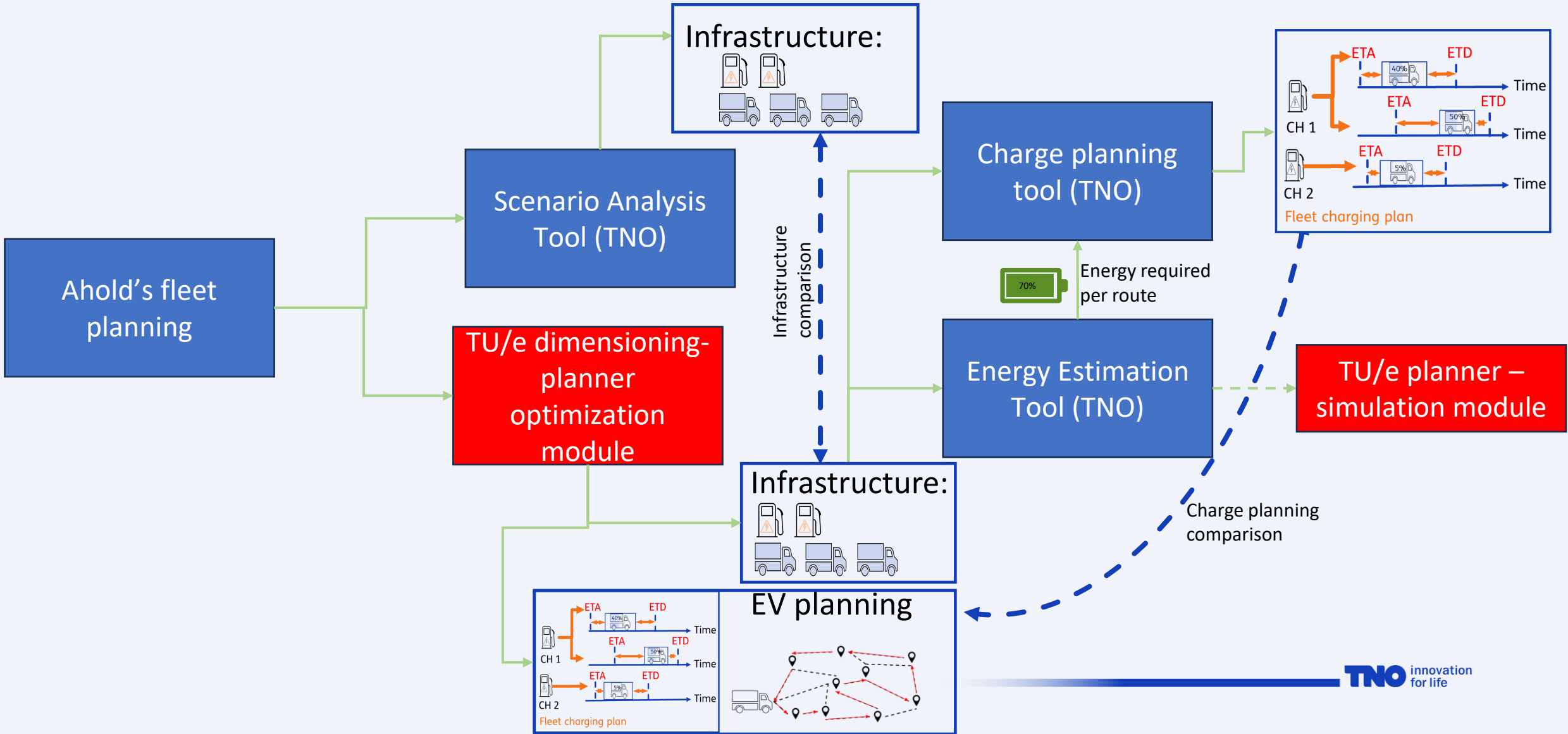
Predicted solar energy consumed from high-voltage SolarOnTop

Predicted solar energy consumption from SOT system can be upto 852 kWh of solar energy can be consumed and upto **560 kWh** can be delivered back to the grid.



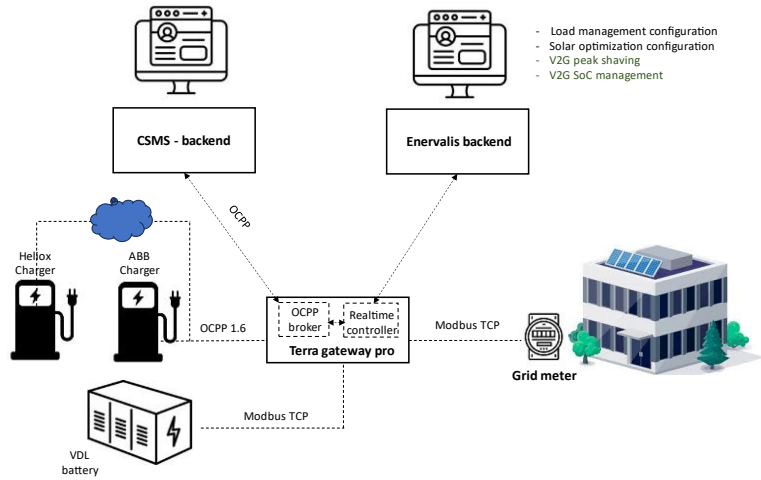


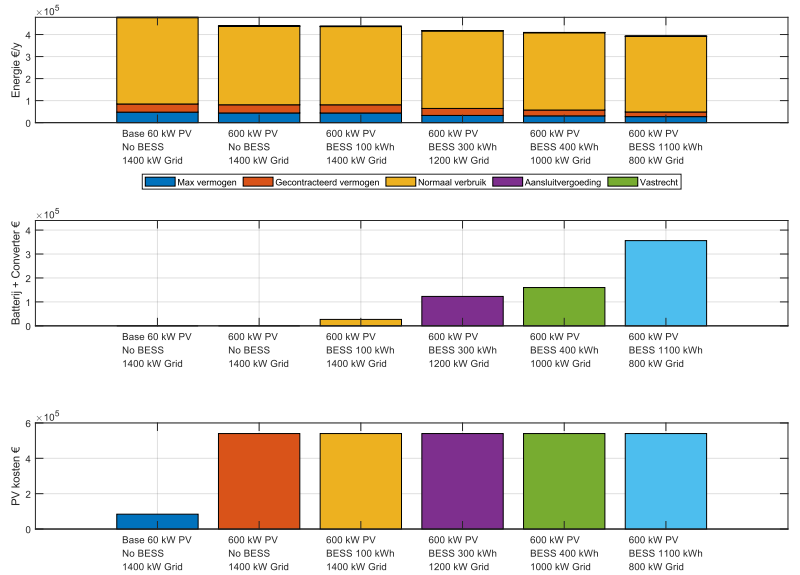
Task 4.5: Developed tools overview



Use-case 1: implementation and validation highlights

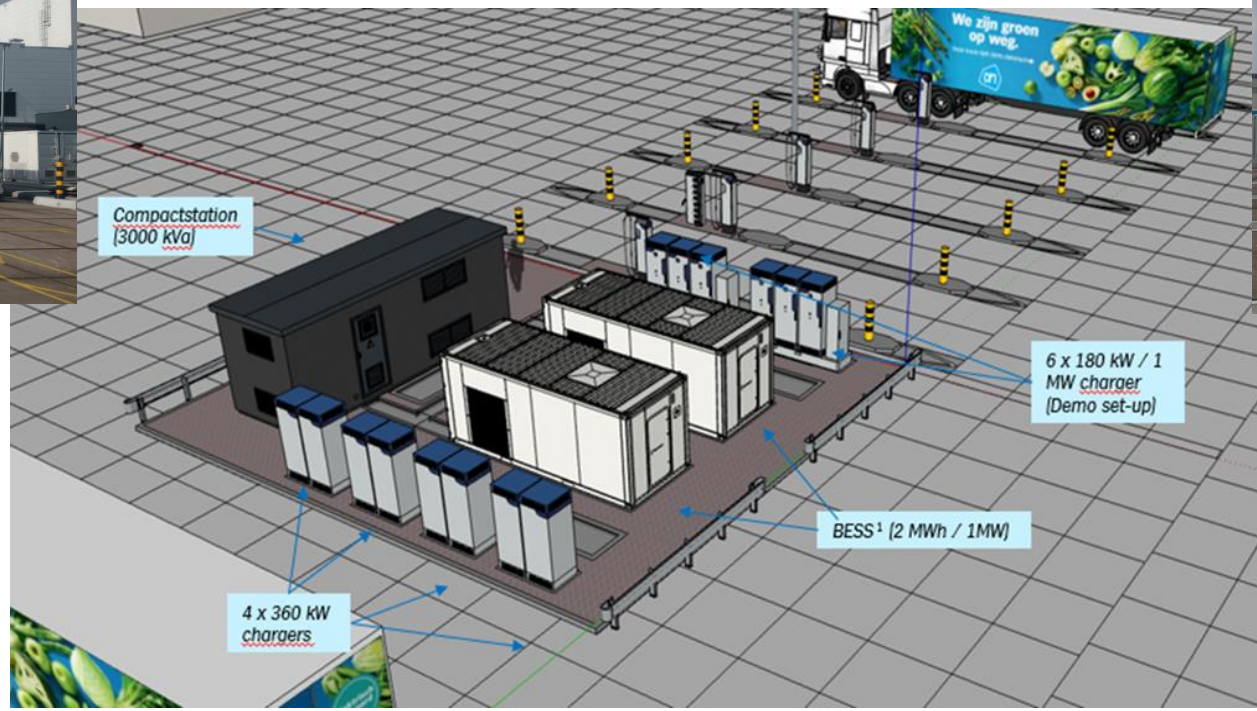
- T4.6 Bi-Di Energy System VDL Laadplein
  - Installed gateway, meters and coils to collect energy data
  - Control of charger and battery not yet successful due to delays, therefor the EMS and VPP is not validated
  - VDL will continue with the implementation and testing of EMS after GTDe
  - Valuable insight for VDL Charging Plaza created with the TNO Homer Grid tool simulations
  - Based on the measurement data and scenario's the optimal combination of Solar and Battery are selected





Use-case 2: implementation and validation highlights

- T4.7 energy profile and fleet planning distribution centre

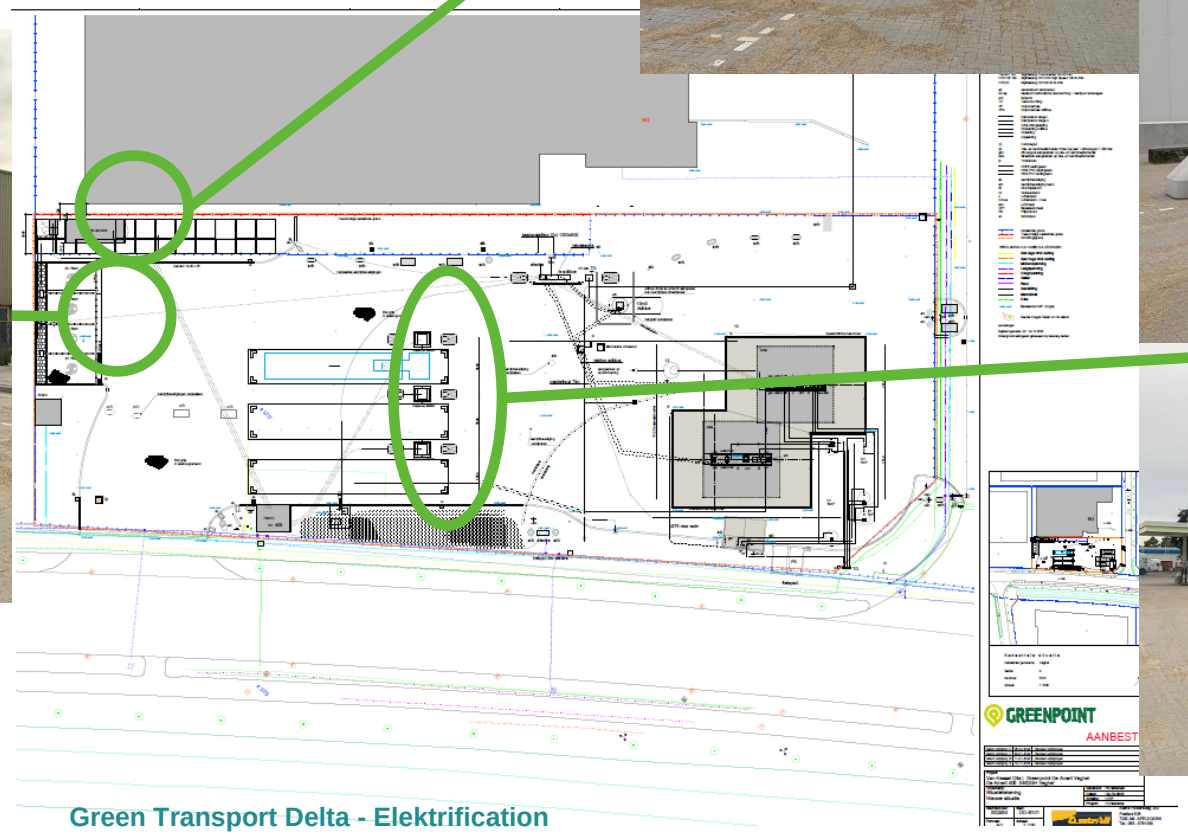


- **98,3%** uptime
- High frequent use per day
- > 450MWh from April

- 1000V / 1000Amp achieved.
- Upgrade to >1300Amp next step.

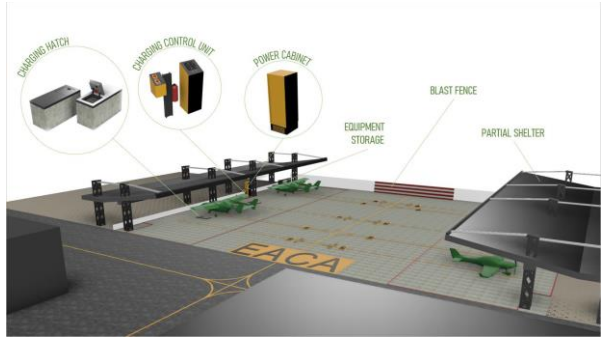
Use-case 3: implementation and validation highlights

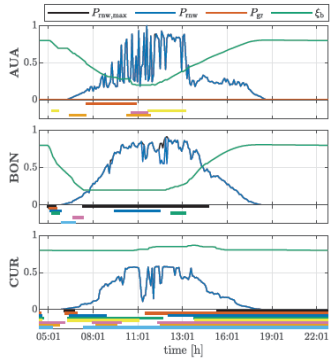
- T4.8 Public Charging
  - Realization of a charge location with BESS and EMS
  - Chargers operational
  - BESS and EMS to be commissioned

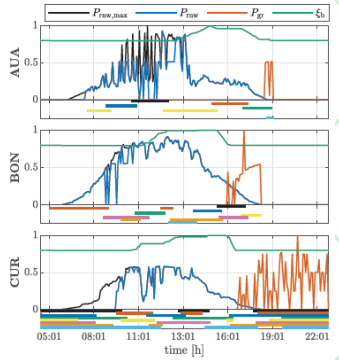


Use-case 4: implementation and validation highlights

- T4.9 Aviation
  - Realization of a mobile test area including a mobile charger
  - Strong lobby for standardization of charging infra in aviation, with CCS becoming the standard over GB/T in aviation in Europe and North-America. Participation in multiple aviation standardisation groups.
  - Co initiator of the Electric Flying Connection (EFC) which organised the EFC tour in cooperation with KLM: 18 electric flights by the E-Flight Academy between Schiphol Airport and Lelystad Airport
  - First smart fast chargers installed at an airside of an airport (Lelystad Airport)
  - Research performed about the first electric aviation networks in the Netherlands and the ABC islands, including energy sizing models.

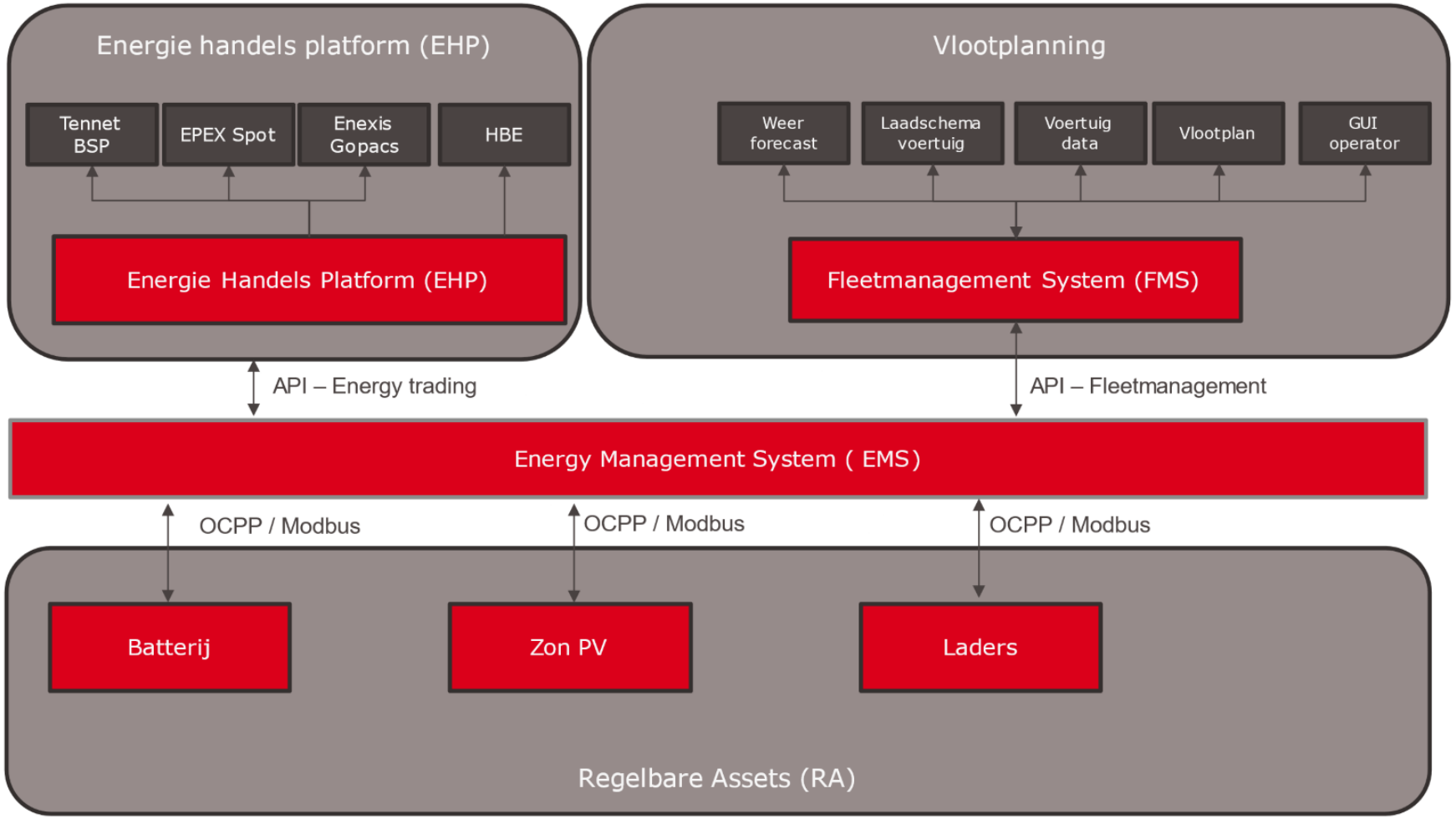






Use-case 5: implementation and validation highlights

- T4.10 Virtual Power Plants



Project Partners