



Solutions for EV fast chargers

Multi purpose DC grid trolley chargers

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PRE Power Developers – Quick facts

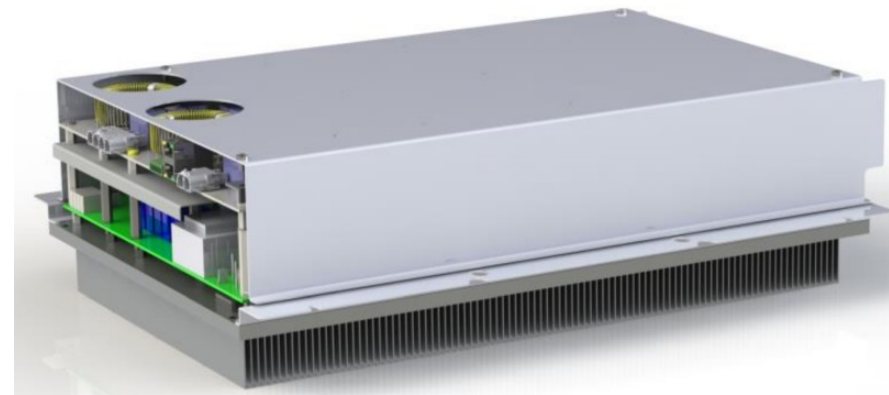
- Founded 1984, 50 people
- High-tech industry of *Power Electronics*
- Supply modules for EV fast chargers since 2009



PRE supplies.....

- **Products:**
 - * power modules
 - * charge controllers

- **Technology:**
 - * blueprints for charger concepts



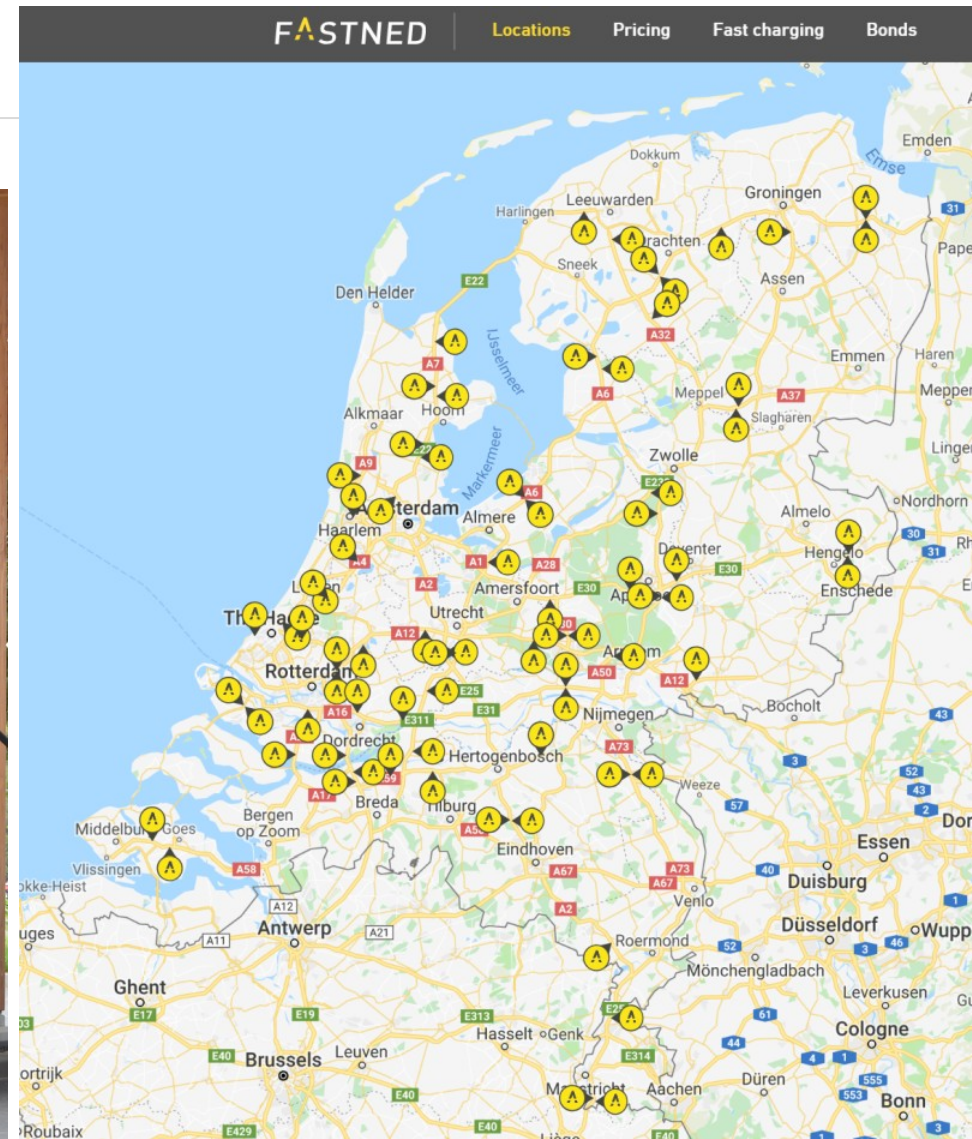
Charging solutions

- Fast charging (EVC products)

12.5kW AC//DC

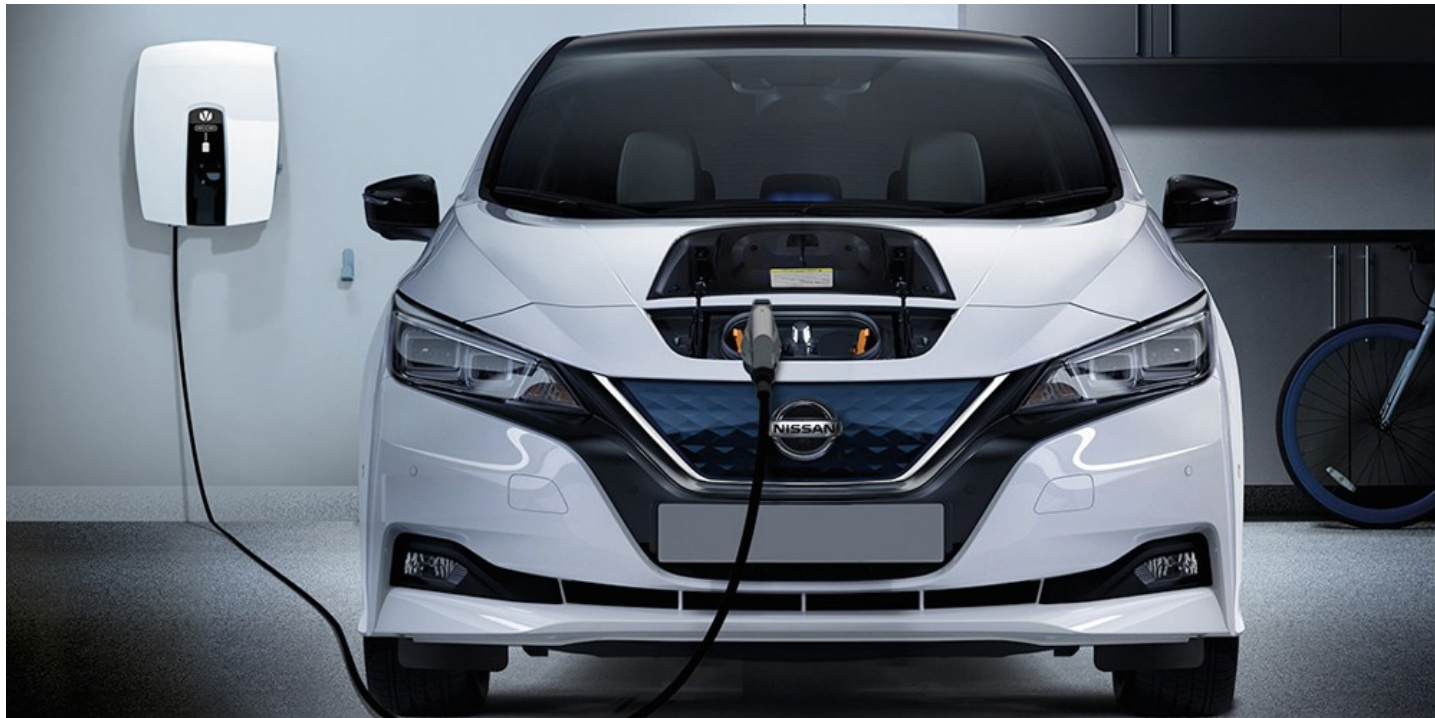


Motorway charging 200–400 km / hour



Charging solutions

- Fast charging (EVC products) 12.5kW AC//DC
- **Home/office DC charging (V2G products) 10kW AC//DC bidirectional**



Home/Office fast charging: 100km per hour



Home/Office bidirectional V2G charging: 100km per hour – support grid – get benefits



Charging solutions

- Fast charging (EVC products) 12.5kW AC//DC
- Home/office DC charging (V2G products) 10kW AC//DC bidirectional
- **Charger parks (EVDC) 25kW DC//DC (u.d.)**

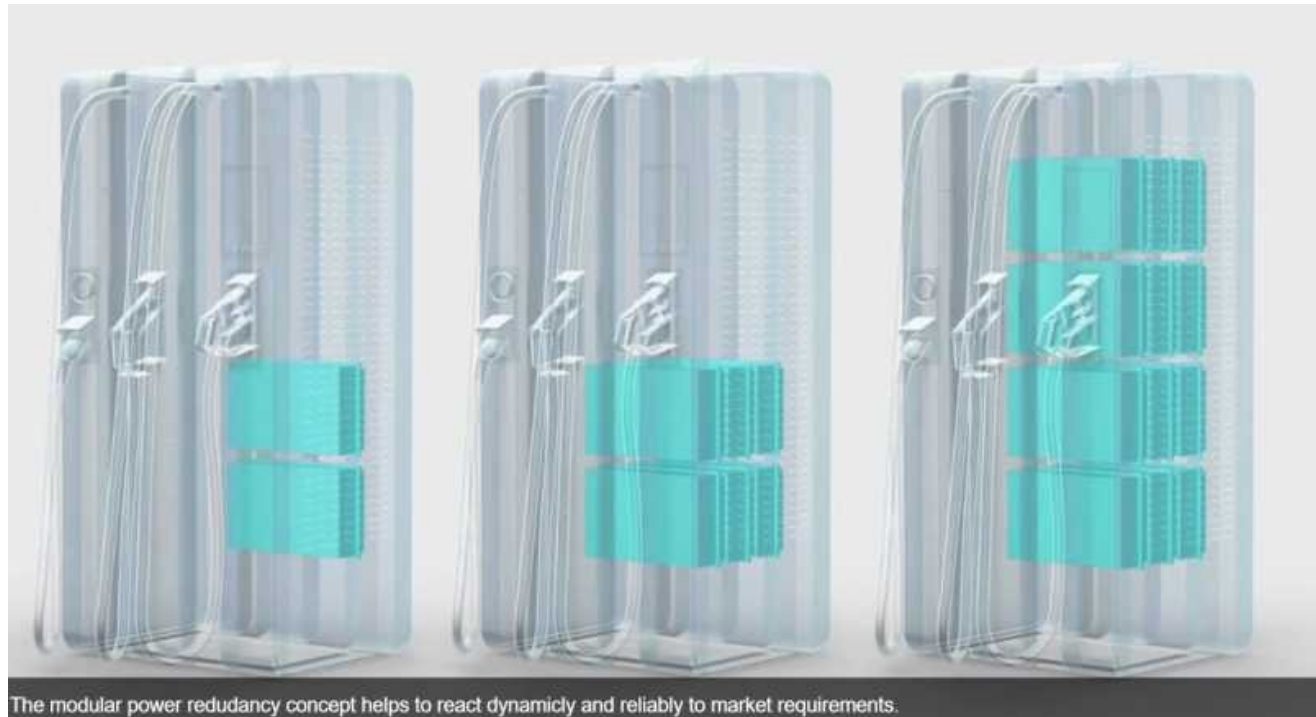


Charge from DC network (trolley, tram) 150kW (700km per hour)



Technology / Modular systems

- Reliability (N+1)
- Future expandable
- 2 plugs at same time
- Low acoustic noise
- 500V and 1000V DC
- Easy to service
→ lowest TCO



- Image source: EVTEC

Technology / Cooling & protection of Charger

- Air cooling
or
- Liquid cooling
 - For compact/slim chargers
 - For invisible (under-the-ground) chargers
 - *Dust and water proof* option (**IP65**)



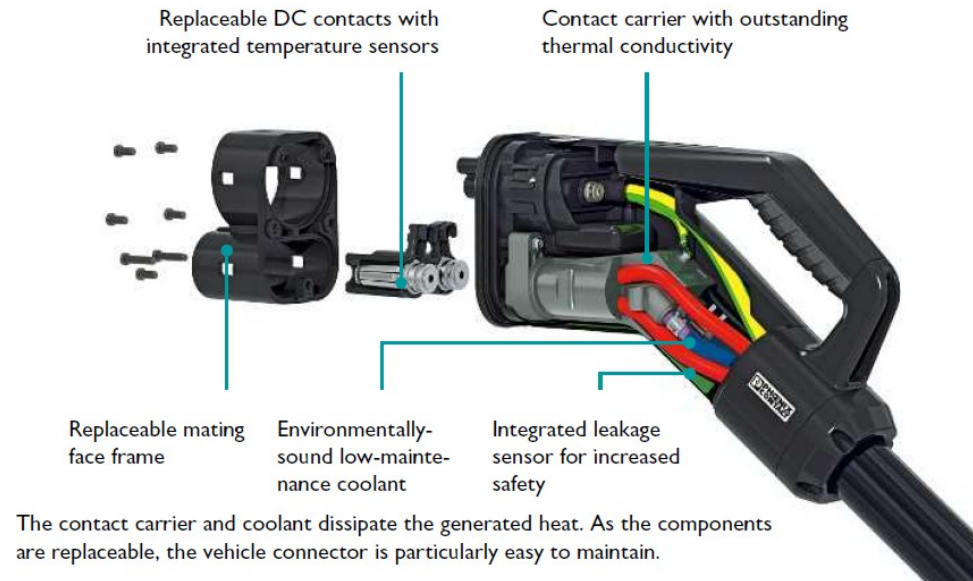
Technology / ready for future batteries

- Current: EV batteries: 200 to 500V
 - New: EV batteries: 200 to 1000V (Porsche Taycan)
 - Future: 1400 V DC / 800kW – competition for Trolley systems?
-
- Higher battery voltage
 - Lower charging current
 - Thinner/Lighter cables



Technology / DC charging cables

- Today: 200A natural cooled
- Coming: 500A liquid cooled
- Innovation:
→ 400A DC *natural* cooled



Example 150kW Espresso & Charge

- 20kW to 150kW, in steps of 10kW
- DC output: 170-1000V, up to 400A
- Charging multiple cars simultaneously
- CHAdeMO (2), CCS (2) and AC (2) output
- Dynamic power management
- Air cooled cable (400A) - proprietary
- Optional DC storage



DC storage / 500kW bidirectional – example

- Battery: 700 V DC
- Trolley grid: 700 V DC (over voltage category III)
- Power: 500kW bidirectional (50 modules)

Features:

- Modular reliability
- Galvanic isolation
- 98% efficiency, from 2kW to 500kW
- DC charging from battery
- Solar charging to battery

PRE's working area and industries

- Solar inverter companies
- AGV companies (fast chargers)
- Marine cathodic protection companies
- Water treatment (Chlorine, UV) companies
- Explosion hazardous areas (chemical plants)
- Stand-alone energy supply companies (inverters)



Since 2009:

- Several charger companies
(EVTEC, ABB, Delta Europe, etc.)

PRE's strategy

- One stop shopping – the best *solution* for every charger
- Services: Reference designs for chargers, up to 500kW
- Reliable supply (multi-source) for manufacturing

Key success factors:

- PRE's leading in innovations and patents
- Vertical understanding up to the end product/customer
- Anticipate on Change.. the energy market, energy transition, standardization

Market of Electrical energy

- Generation: 0.03 to 0.06 EURO per kWh
- Consumer rate: 0.25 EURO (flat rate) → 6 times cost price!
DC charging: 0.29 – 0.59 EUR per kWh (Fastned)
- Today: Month price - based on highest month peak
(= Punishment system)
- Future: depend on supply and demand, and congestion
(= Reward system)



V2G in Europe

- Ovo Energy (UK)
- Newmotion

OEM's

- Nissan
- Mitsubishi

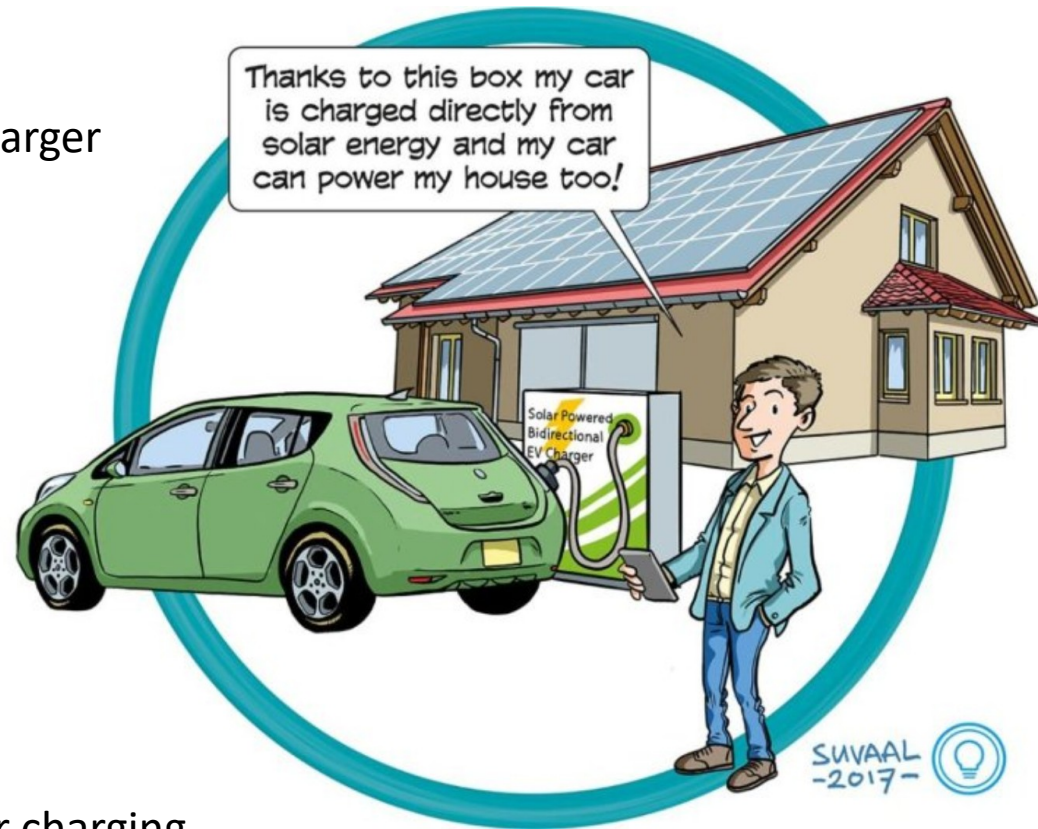


PRE's innovations

- Full range of SiC converters for any charger
- Future (standardization) proof
- Reliable modular concept
- Patents

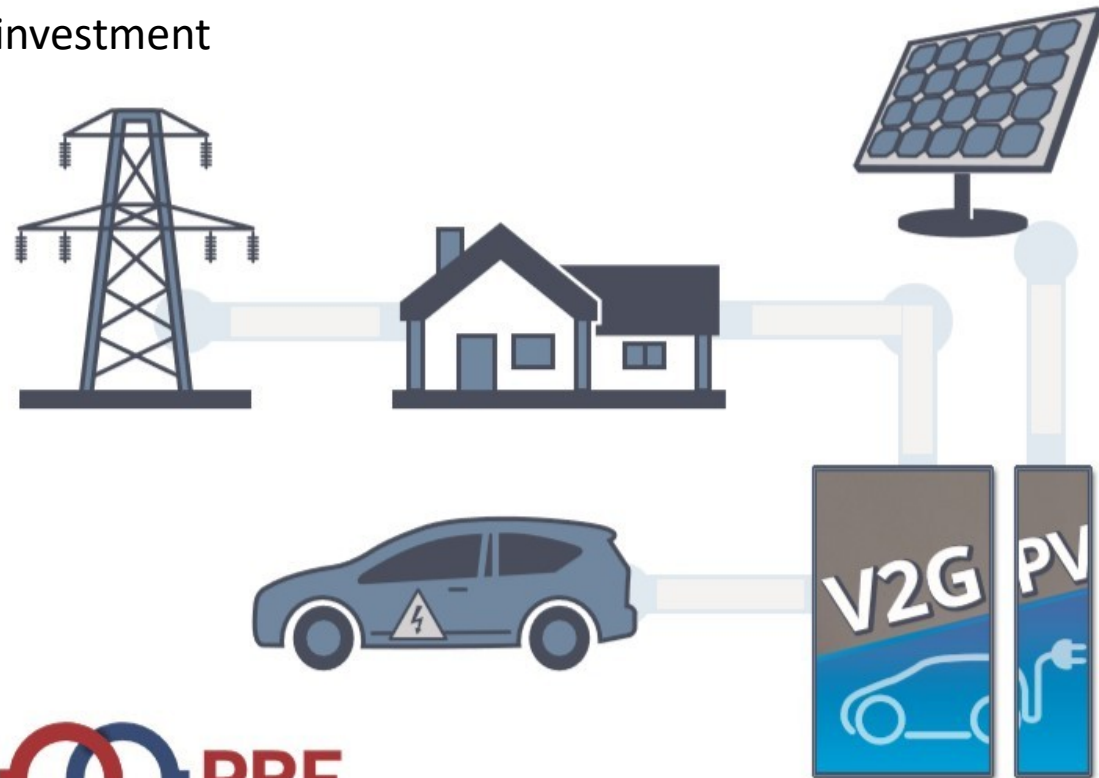
Examples:

- *Reactive* power capability
- Vehicle to grid (V2G) converters
- Integrated solution: V2G + direct solar charging



V2G + direct solar charging / features...

- Zero-energy dwelling: *no* grid interaction (8 months)
- Cost reduction (50%) for PV solar investment
- No Solar grid entry, *no* taxes
- Charge EV or HES



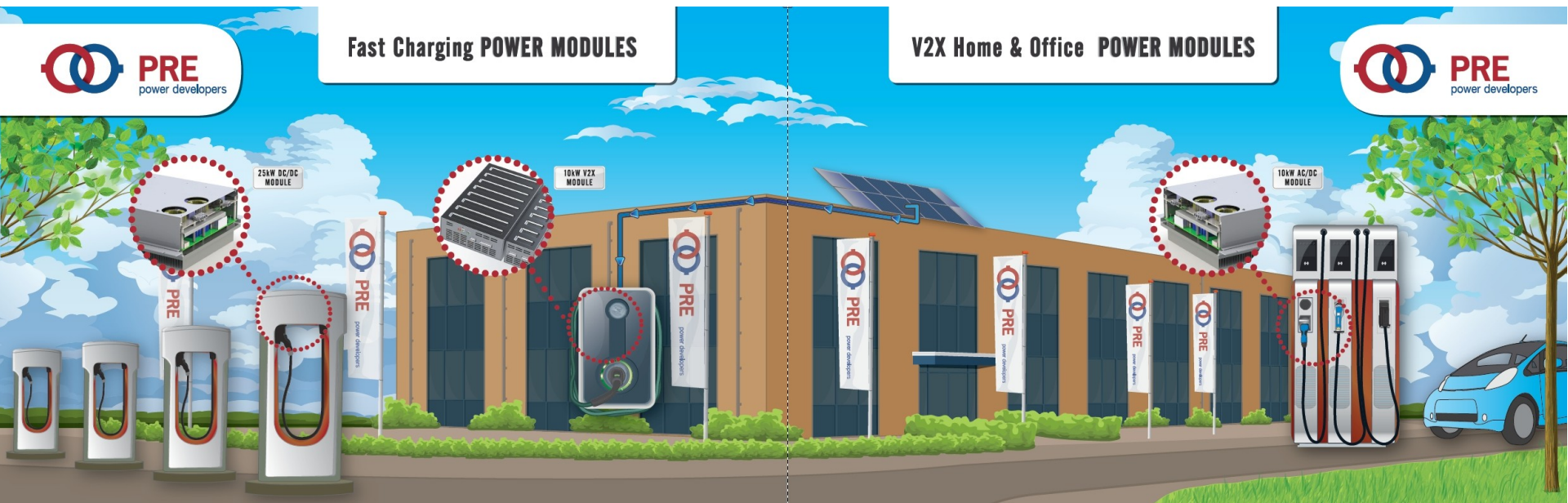
Fast charging solutions / summary

- Motorway charging: 12.5kW AC/DC module
- Home / office charging: 12.5kW AC/DC module
- Home / office V2G charging: 6kW / 10kW bidirectional module
- Trolley catenary charging: 15kW DC/DC module
- Charger parks: 15kW DC/DC module
- Energy storage systems: 10kW bidirectional module

Datasheets: [PRE power developer products](#)

Summary PRE power developers

- Innovative, leading product portfolio to serve OEM charging companies
- Fast charging from trolley/tram catenary system: (cost) efficient solution
- Thank you for your attention!



PRE on the web – links..

- Products PRE power developers
- LinkedIn
- Facebook
- Flyer

