CharIN – Charging Interface Initiative e. V.

Megawatt Charging System (MCS): Standardizing the Backbone of the Future of High-Power E-Mobility

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EVS 38
Gothenburg, Sweden, 2025

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Reference: CharIN Compliance Guideline

Opening & Welcome

Gunnar Ohlin
Program Manager e-Mobility
Lindholmen Science Park

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Agenda

Megawatt Charging System (MCS):
Standardizing the Backbone of the Future of High-Power E-Mobility

- **a comprehensive update on the technical development, standardization, and global applications of the Megawatt Charging System**
- **showcase how MCS is enabling electrification of high-power transport sectors**
- **commercialization and industry readiness**
- **Q&A**

“The critical role of MCS in the electrification of heavy-duty transport”

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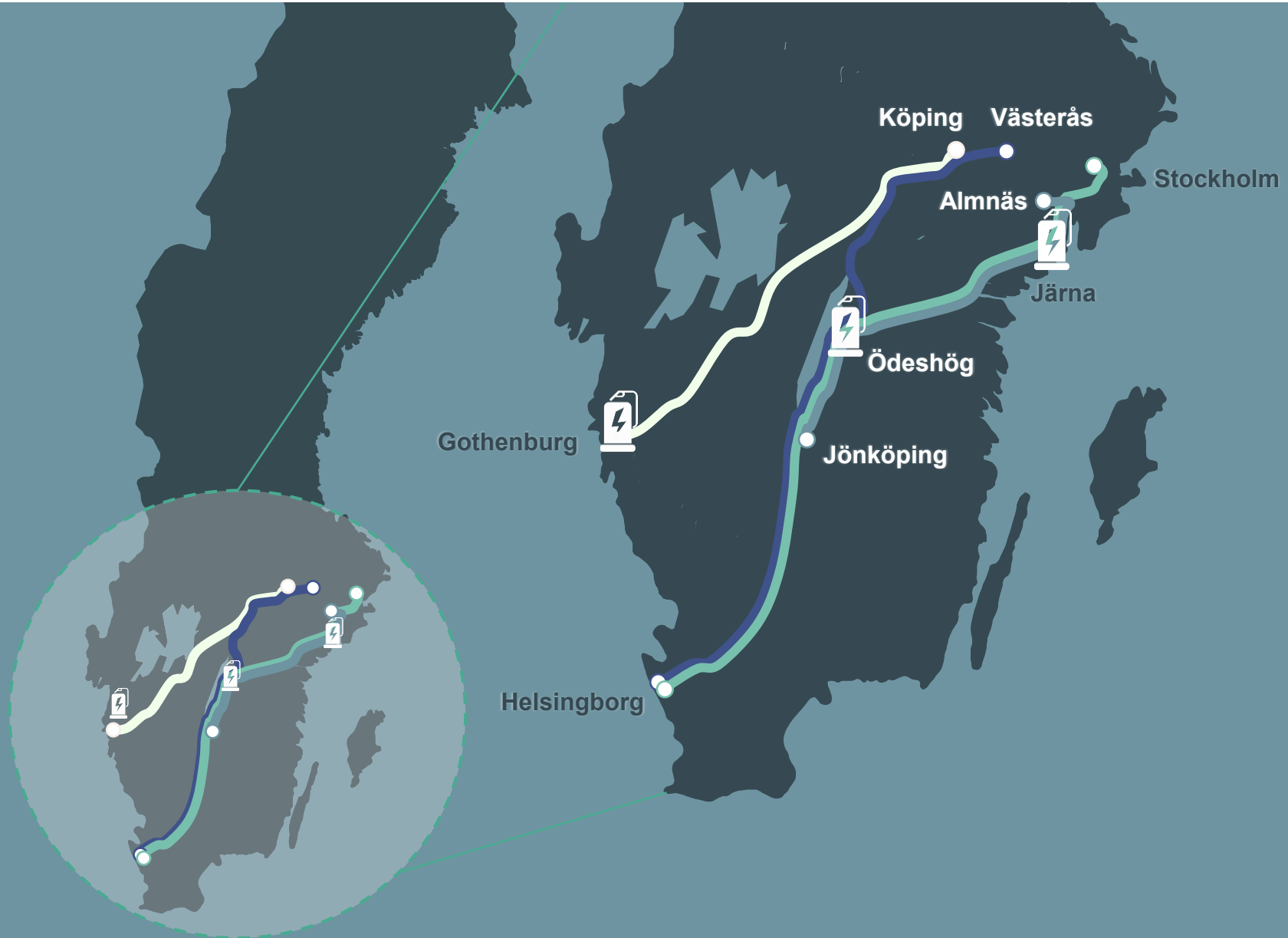
E-Charge
System demonstration of long-haul BETs

e-Mobility

FFI Fordonsstrategisk Forskning och Innovation

Initial system demonstration



E-Charge

FFI Fordonsstrategisk Forskning och Innovation


Circle K Vädermotet
Gothenburg, Sweden


OKQ8 Ödeshög
Ödeshög, Sweden


milence
400kW
milence


AD DISPLAY
19" SCREEN
INDIVIDUAL OR PUBLIC AD USE
REMOTE INDEPENDENT CONTENT MANAGEMENT
READY
DELTA
VESTEL
> 1 MW
1500 A
SIEMENS
030%
AUTHENTICATE TO STOP
HEAVY becomes
AUTEL
HYC1000

Scaling Electrification with Megawatt Charging – A CharIN Perspective

Claas Bracklo
Chairman
CharIN

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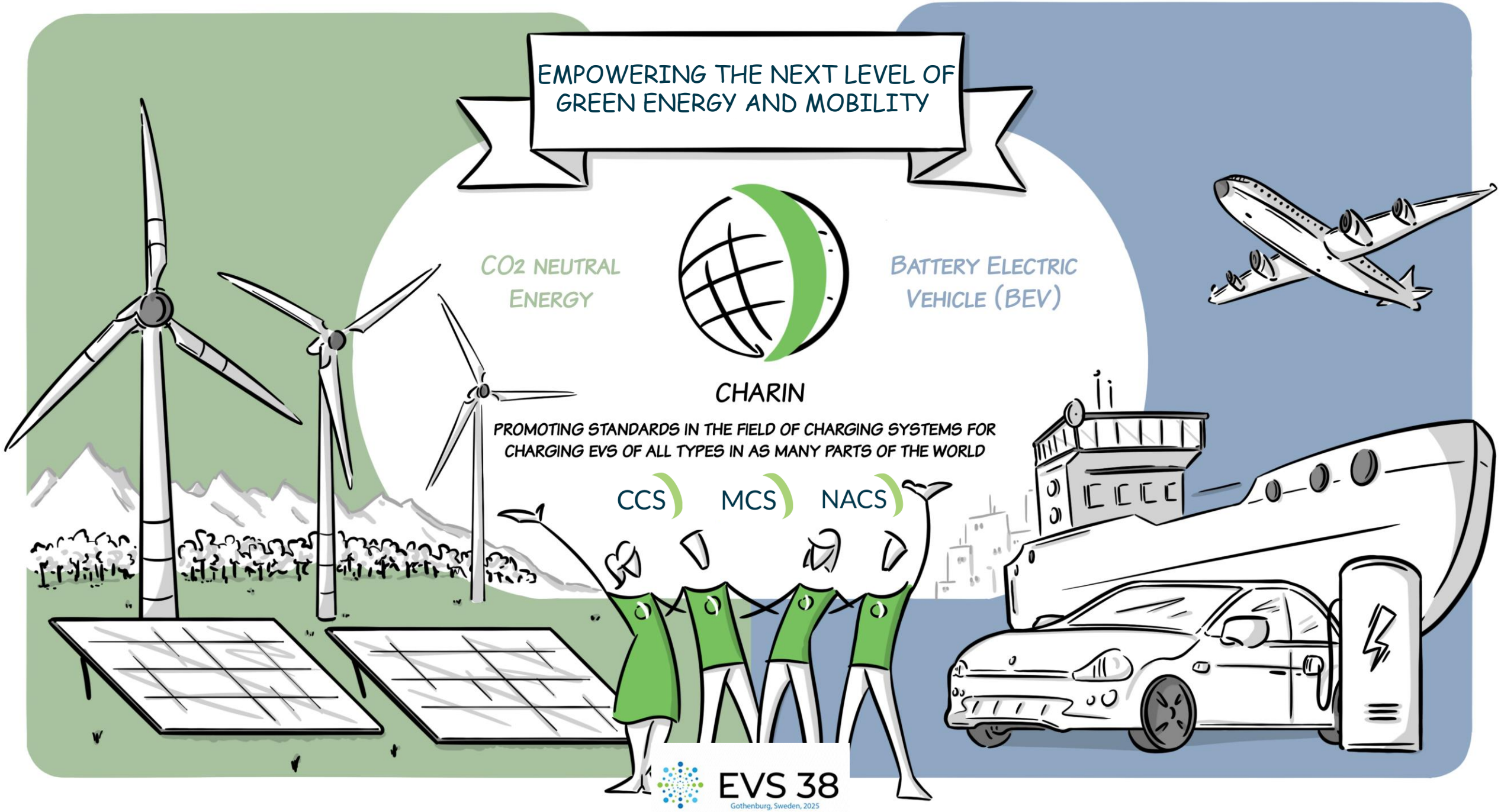
EMPOWERING THE NEXT LEVEL OF GREEN ENERGY AND MOBILITY
CO2 NEUTRAL ENERGY
BATTERY ELECTRIC VEHICLE (BEV)
CHARIN
PROMOTING STANDARDS IN THE FIELD OF CHARGING SYSTEMS FOR CHARGING EVS OF ALL TYPES IN AS MANY PARTS OF THE WORLD
CCS
MCS
NACS
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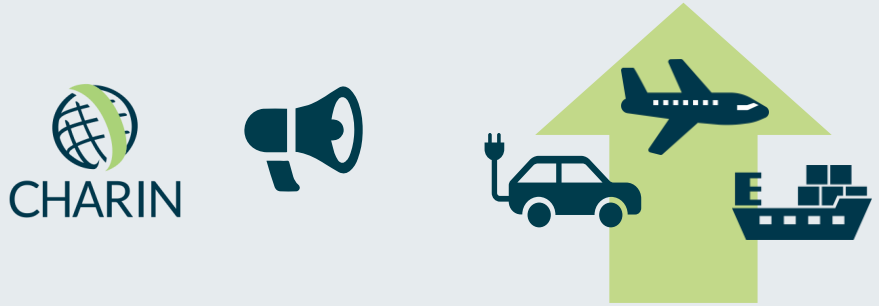
CharIN´s Vision

The overall scope

The Charging Initiative e.V. (CharIN) is a non-profit association promoting **interoperability of global charging solutions** for vehicles of all types, and to define requirements for the **evolution** of charging related standards and for the **certification** of CCS, MCS and NACS based charging products.



The alliance strongly promotes the **adoption of charging standards,** including, but not limited to, **CCS, MCS, NACS, ISO/IEC 15118** and related standards, together with all measures and services connected therewith.

CharIN undertakes **activities in the different world regions** to promote charging of electric vehicles as well as charging in the aviation and marine sector, supporting battery powered mobility, and related technologies.

CharIN´s Mission

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Promoting standards in the field of charging systems for charging EVs of all types in as many parts of the world

1 **Spread the word**
Promote awareness of consumer benefits of a common CCS, MCS & NACS standard and create more visibility

2 **Broadening the tent**
Collaboration between involved parties in EV charging incl. regulators, industry, + EV related associations

3 **See it means believe it**
Proof of concept by live Testivals, Plug & Charge demonstration, customer journeys, and others to a wider public

Conferences, Exhibitions & Round Tables

TUESDAY

Social Media

Focus Groups

Projects

Plug and Charge Europe

Wirkkette Laden Verbundprojekt

Partners

AEDIVE · AVERE · Clean Energy Business Council · EEBUS · EPRI · FIA · ISO · Maritime Battery Forum · EVS 38 Gothenburg, Sweden, 2025 · VDA

TESTIVAL

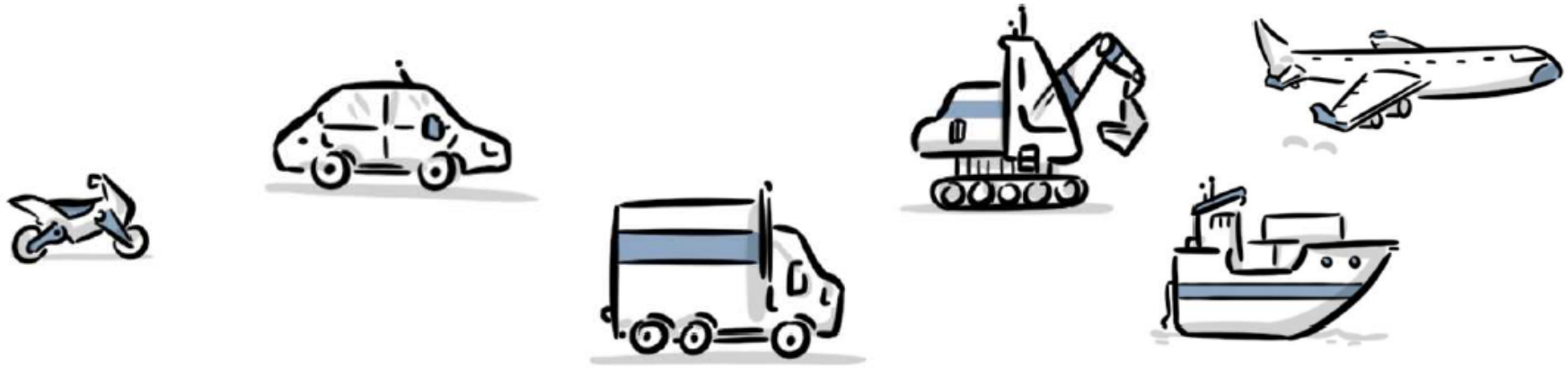
CharIN CCS Certified

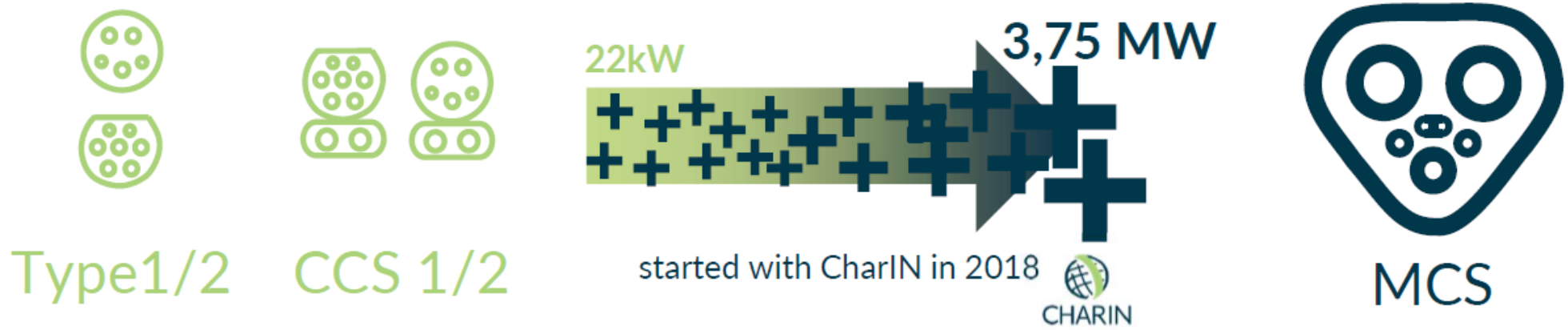
ACADEMY

Plug & Charge

Dashboard (here)

Evolution from CCS to MCS





Why MCS?

The motivation to develop a Megawatt Charging System

Quick charging of **large batteries**

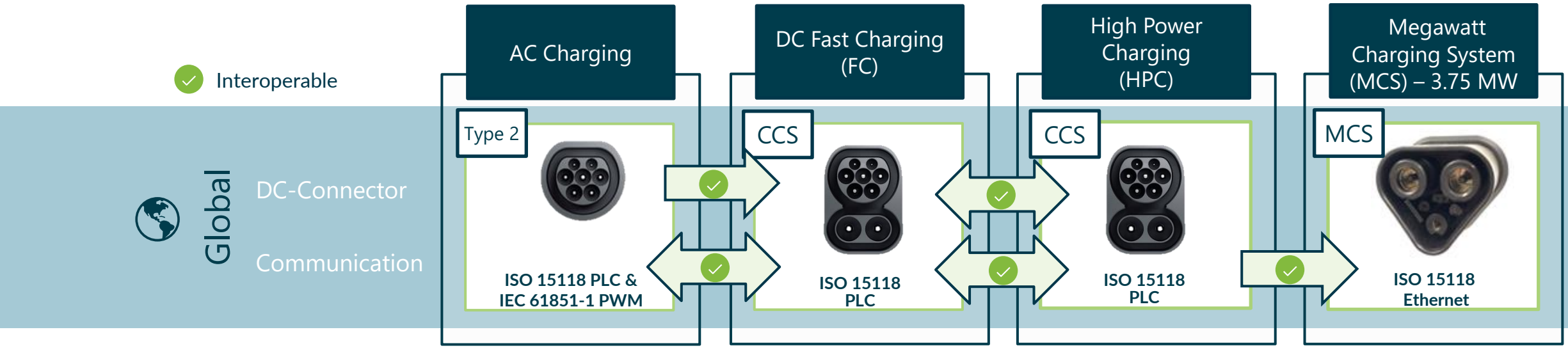
Charge 200-600 kWh batteries in 20-30 minutes
→**power levels exceeding 1 MW are required**

No **sufficient and safe** charging solution available

Common development of a solution that is adopted by all relevant players

One system for all

CCS and MCS



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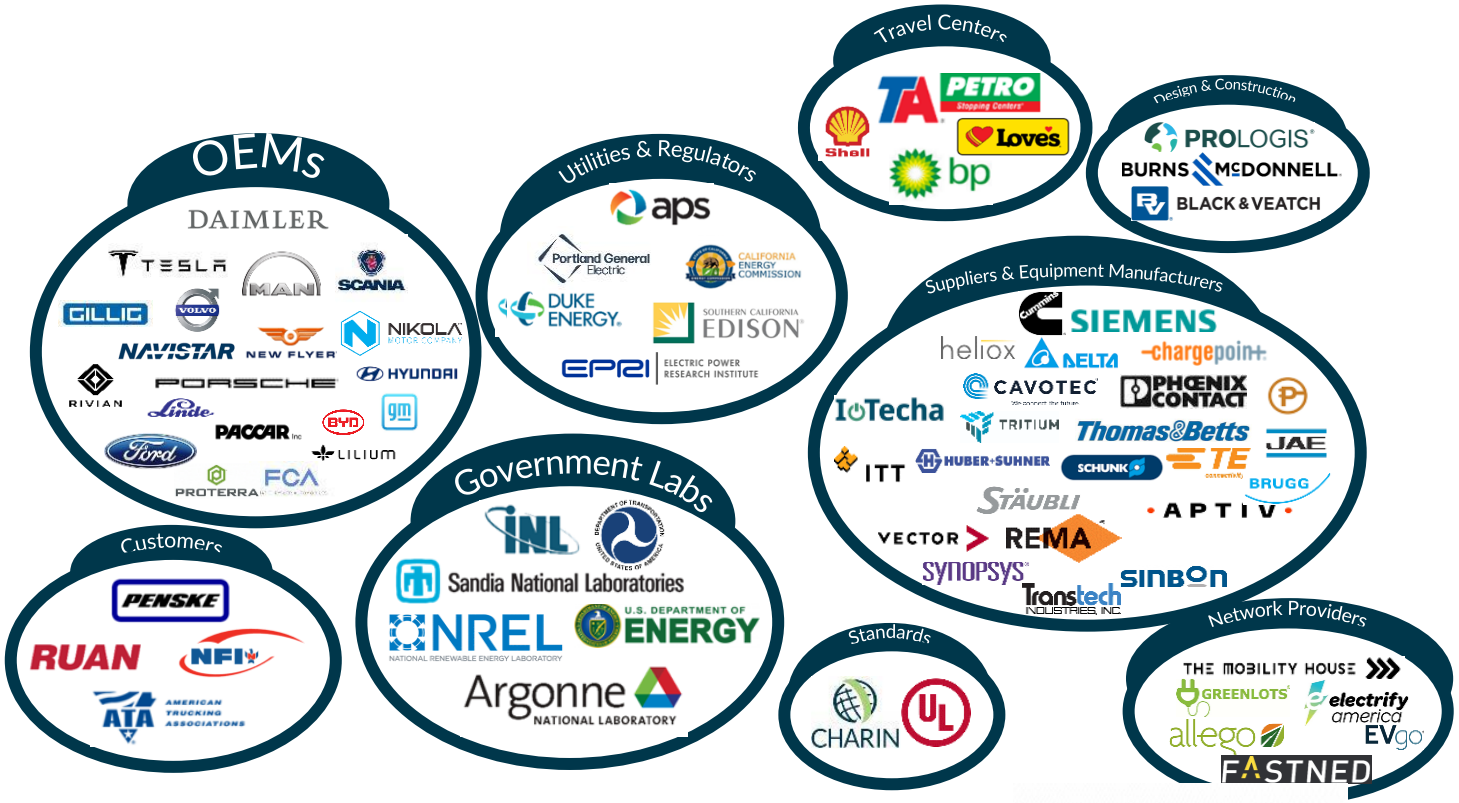
Megawatt Charging System

Motivation and Scope

A CharIN Task Force was formed in March 2018 with the statement:

“Define a new commercial vehicle high power charging standard to maximize customer flexibility.”

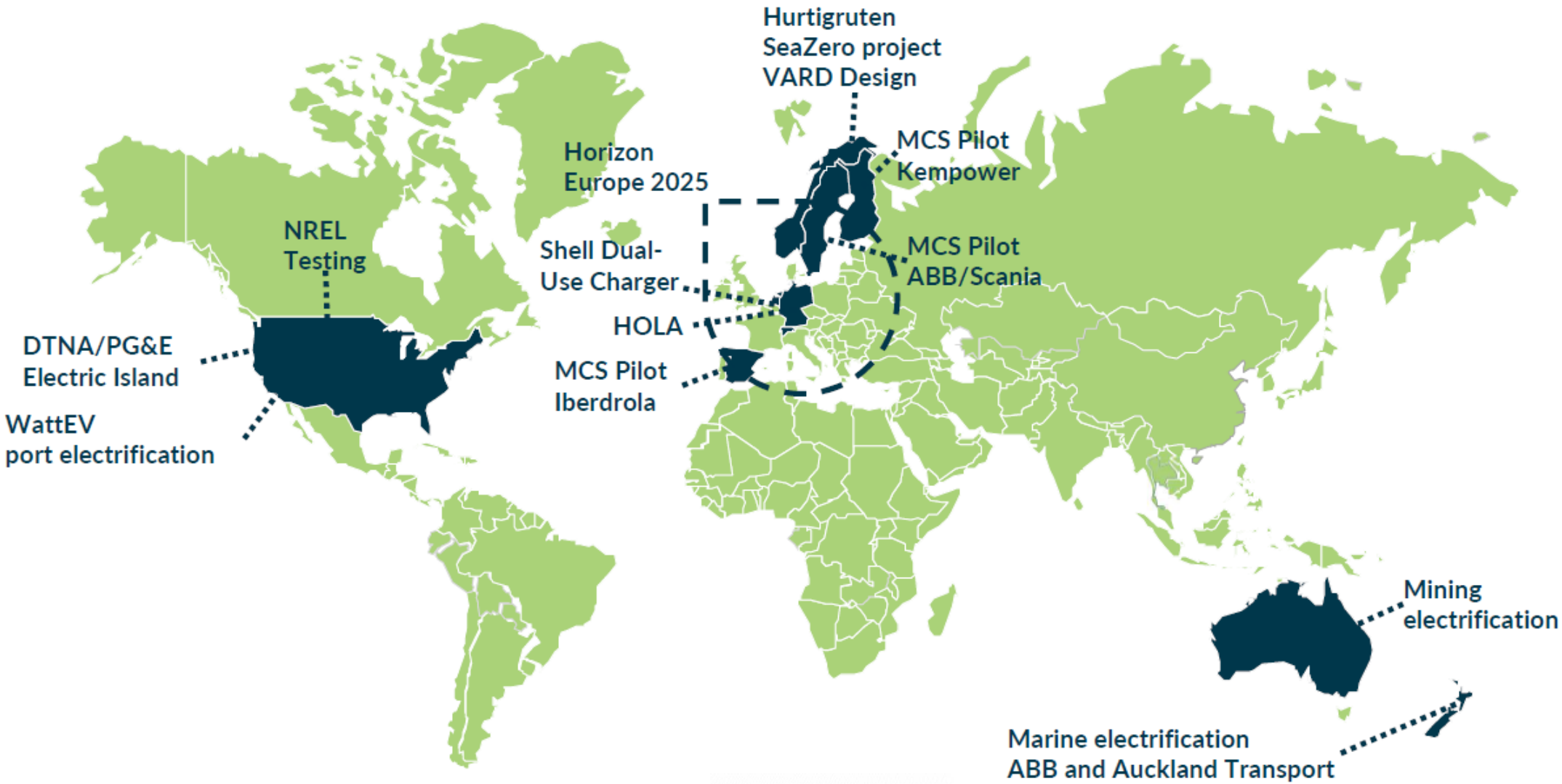


Requirements (excerpt)

- Single conductive plug
- Max 1.250 VDC
- Max 3.000 ADC
- ISO/IEC 15118 communication (Ethernet)
- Capable of being automated
- Cyber-Secure
- V2G (bi-directional)
- Touch Safe
- Located on the left side, roughly hip-height
- On-handle software-interpreted override switch

Global MCS Activities

Public and Private Funded Pilots



Standards Update: ISO/IEC Progress on MCS

Jeremy Schofield
Director of Technology
CharIN

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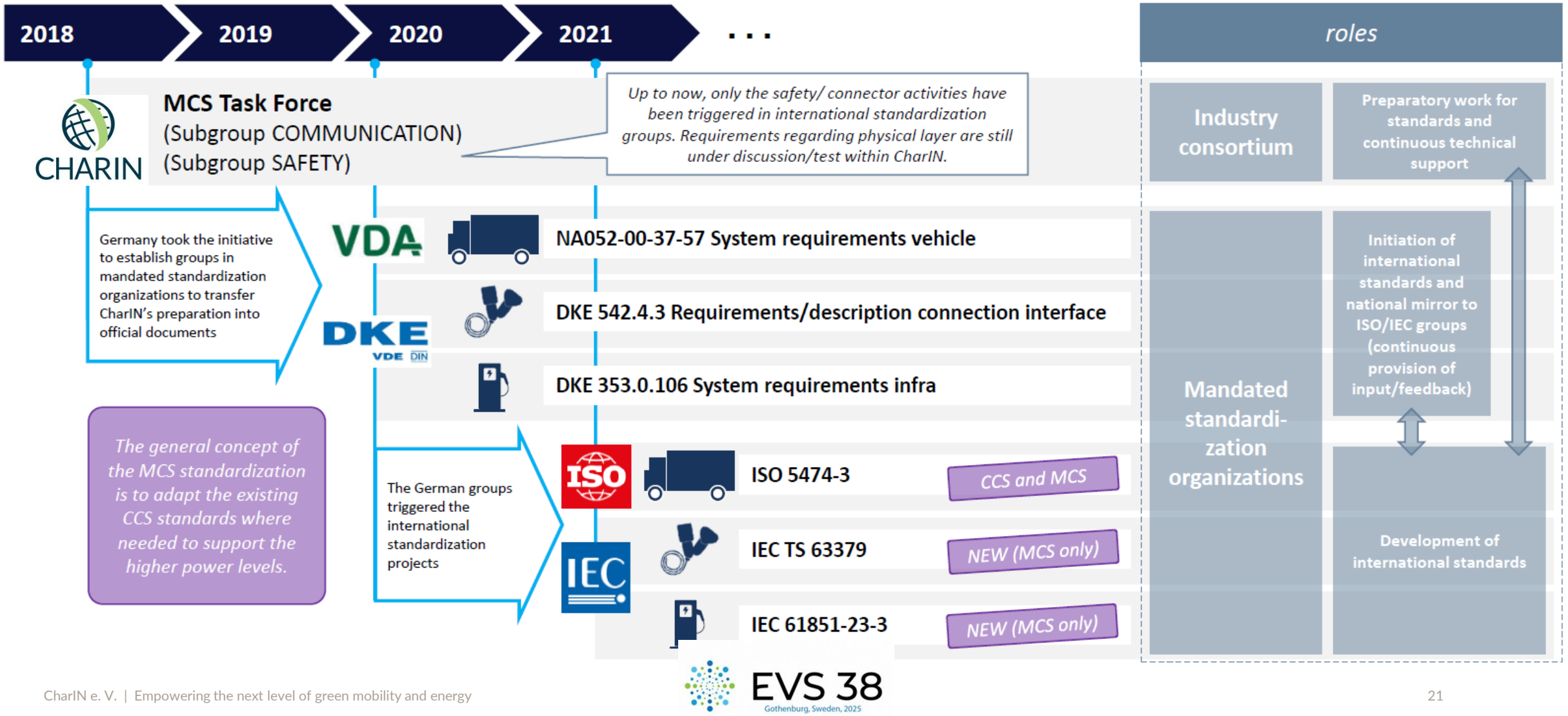
International Groups involved

The history and roles of the international groups involved



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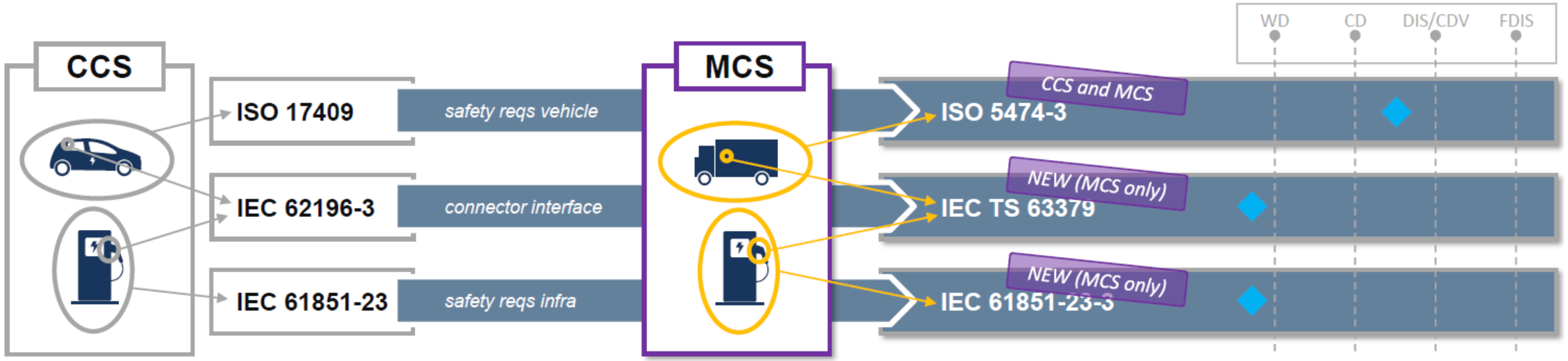
International Groups involved

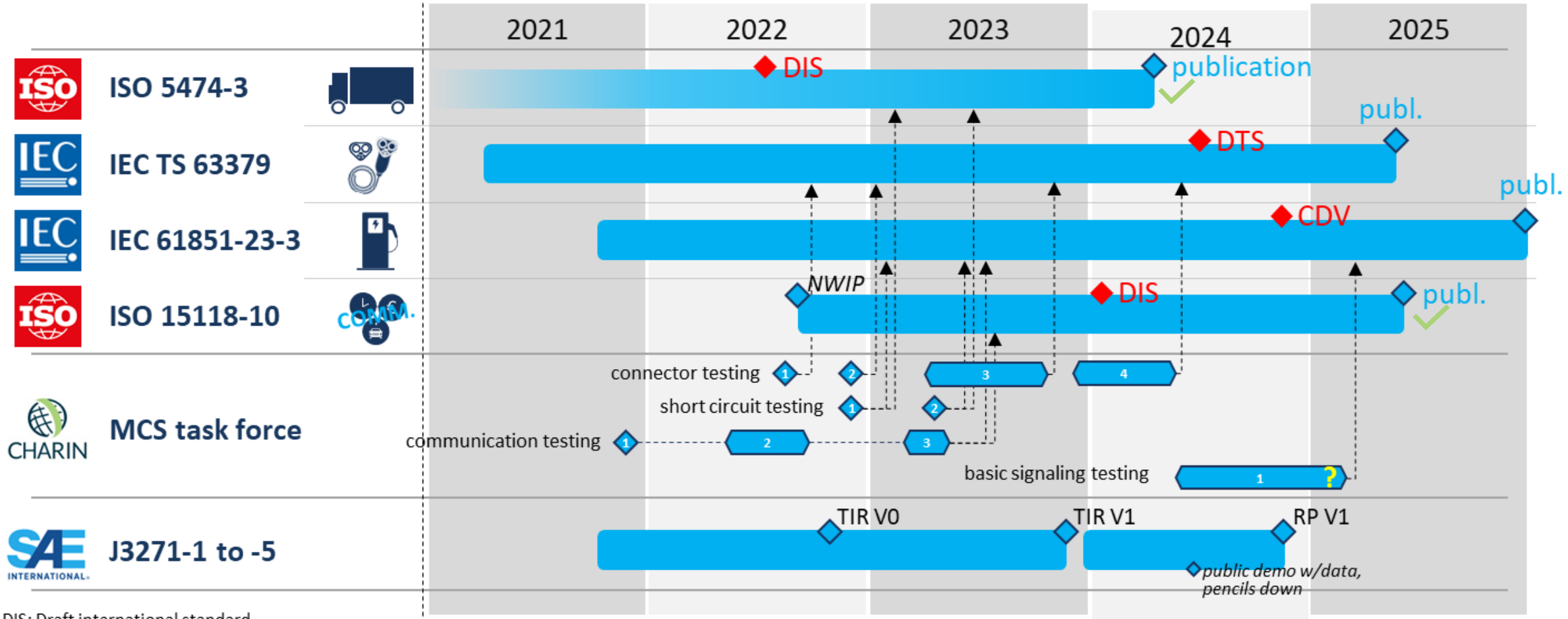
CCS standards are taken as a baseline to derive the standards for MCS



- MCS is currently developed to achieve **1250V and 3000A**
- **Compatibility of charging control and PLC will be provided; optional integration and upgrade capability supported**
- Conceptual parameters will be left unchanged in order to support/ease coexistence of both systems in a vehicle
- The **increased charging power results in several adaptations**

MCS Standardization Roadmap

Timelines and key milestones of international groups involved in MCS standardization



DIS: Draft international standard
DTS: Draft technical specification
CDV: Committee draft for vote
TIR: Technical Information Report
RP: Recommended Practices

End of commenting phase for DIS/ CDV/ DTS roughly 8 months before publication. DIS/ CDV/ DTS is the last stage that allows for technical changes.

National Renewable Energy Laboratory (NREL) Testing

Connector Geometry

Test Setup

- Finger safety
- Functionality
- Fit & ergonomics
- Temperature rise
- Weight evaluation
- Cooling capability up to 300A

4th test phase October 2023
with hardware and communication related tests

Two test benches:

- Ambient-cooled - up to 350A
- Liquid cooled - up to 3000A

Sponsors

gna CLEAN TRANSPORTATION & ENERGY CONSULTANTS
CHARIN
U.S. DEPARTMENT OF ENERGY
South Coast AQMD
CALIFORNIA ENERGY COMMISSION
DAIMLER Daimler Trucks North America

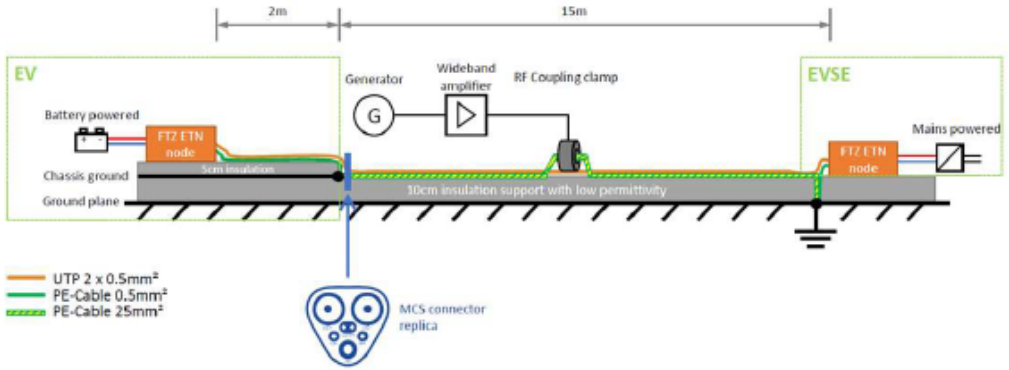
University of Zwickau Testing

Ethernet Communications Testing

Test Setup

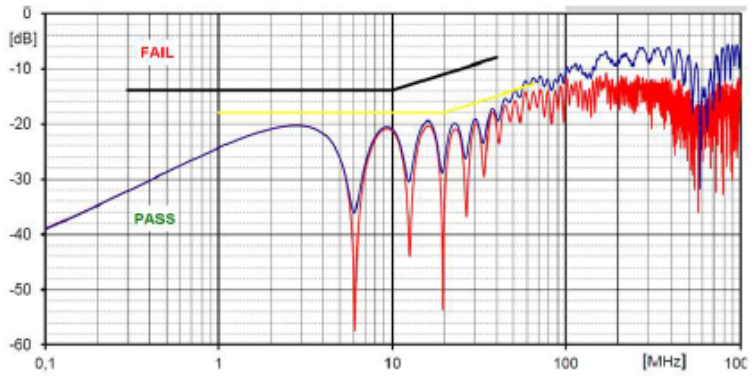
- BCI coupling into the data lines
- BCI coupling into the PE line
- Capacitive coupling into the EV chassis to emulate the return current from Y-capacitors

FTZ FORSCHUNGS- UND TRANSFERZENTRUM E.V. an der Westsächsischen Hochschule Zwickau



Results

- Capacitive Coupling: no malfunction of communication systems up to maximum applied test power
- Ethernet 10BASE-T1S – UTP → more than 36 dB margin to maximum allowed noise level @ HV lines



Sponsors

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DAIMLER TRUCK
VOLVO
CHARIN
Alpitronic
MAN
heliox
Shell

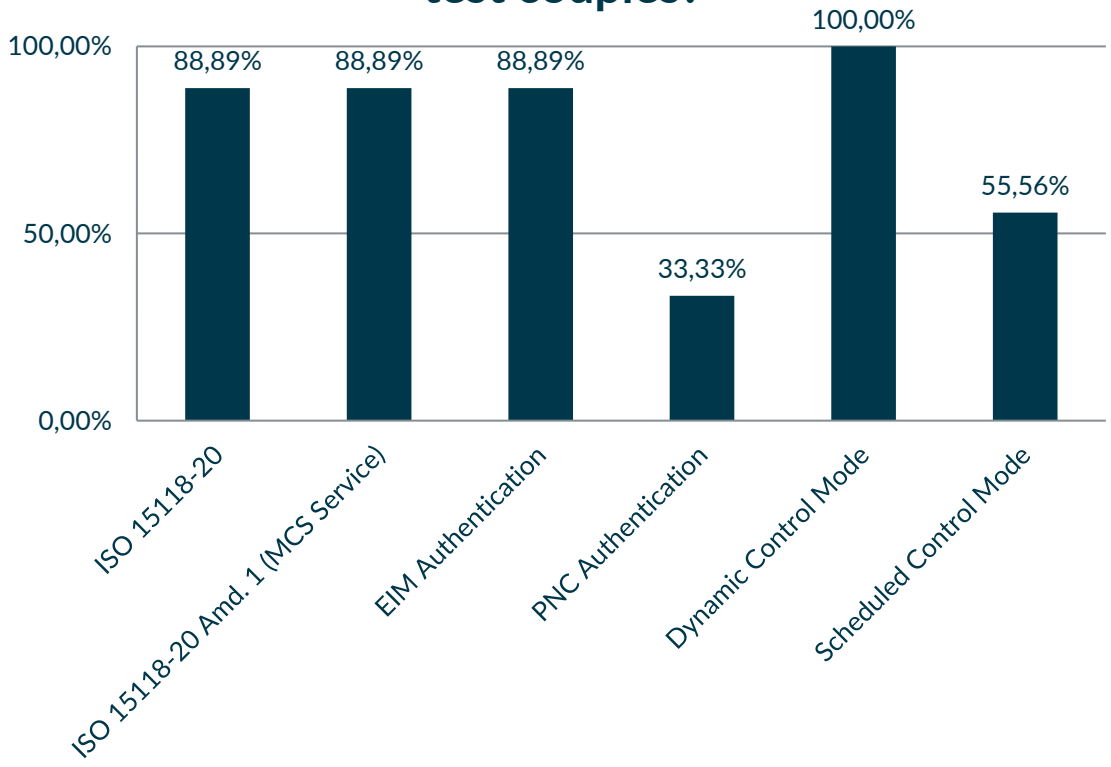
MCS Controller Testival 2025 – Hosted by Autel Energy

Overall experience and suggestions

- Testing equipment handled by own company itself, procedure comfortable.
- Very good: The preparation and organization of the event.
- Could be improved: Providing the certificates for TLS connection
- Issues occured with PKI prior to the event.
- Good opportunity to test the compatibility between the different systems.
- Organisation was good as always :) Evening event was well chosen. Thanks for organizing!

Technical Feedback

Which standards were involved in these test couples?



MCS in High-Power Use Cases – From Mining to Aviation

Frances Sprei
Professor in Sustainable Mobility
Chalmers University

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Panel Participants

MCS in High-Power Use Cases – From Mining to Aviation

Topics that will be discussed

- Challenges and opportunities for MCS in heavy-duty vehicles, construction equipment, mining, marine, and aviation
- Developments in regulations and policy
- Research and development in private industry
- Global standardization and interoperability
- Technical readiness and infrastructure requirements

Marc-André Beck
Founder & CEO
Grivix

- grivix has developed an **autonomous charging system** that provides a seamless, safe, convenient and extremely fast charging experience for various heavy-duty vehicles in the automotive, mining, marine and aviation industries.

Bassem Farag
CTO & Cofounder
Energy Node

- CTO and Co-founder of Energy Node.
- More than 10 years of experience in battery system development for aerospace and automotive.

Jorge Soria Galvarro
Sr. Technical Advisor
Scania

- Advisor for Charging Infrastructure
- Representative from Scania in ACEA (European Automobile Manufacturer‘ Association) working closely with policymakers, industry bodies, and regulators on legislation and related policy matters

Fireside Chat: Commercialization & Industry Readiness

Jeremy Schofield
Director of Technology
CharIN

Anne-Lise Deraedt
VP EMEA, Energy & Charging Infrastructure
Einride

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Audience Q&A + Closing Remarks

Gunnar Ohlin
Program Manager e-Mobility
Lindholmen Science Park

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Thank you for your kind attention!

Any questions?

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