



CHAdemo

CHAdemo: the enabler of EV bi-directional charging (V2X)

Risø, 21 November 2018

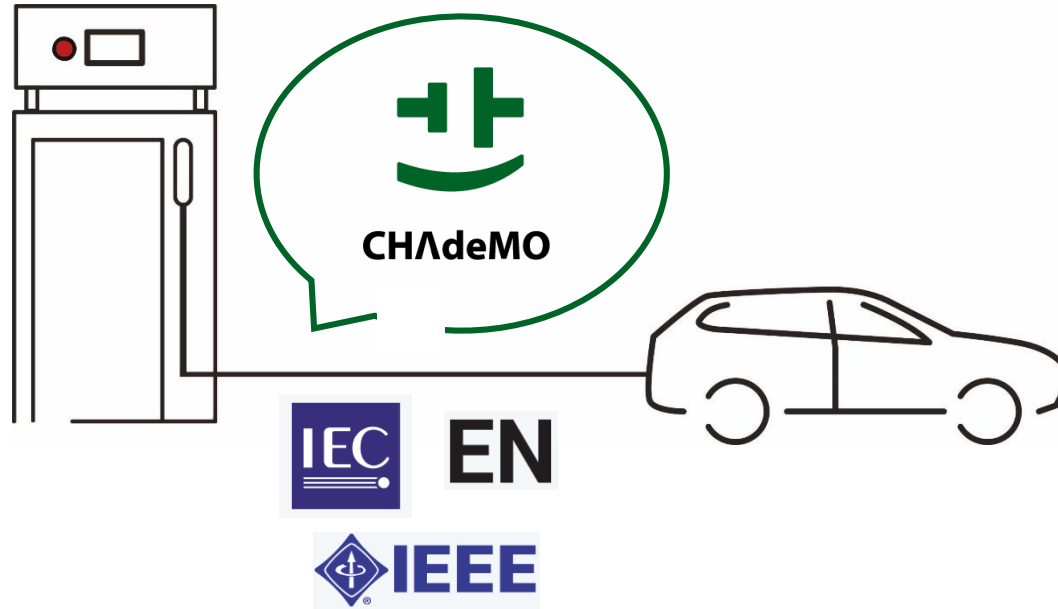
Tomoko BLECH

Agenda

- CHAdeMO basics
- CHAdeMO V2X
 - History
 - Standardisation & certification
 - Product & system developments
- CHAdeMO principles for evolution
- Summary



CHAdeMO and CHAdeMO Association



What do we do?



Association members



Who are
our
members?

413
entities

41
countries

And many, many more..

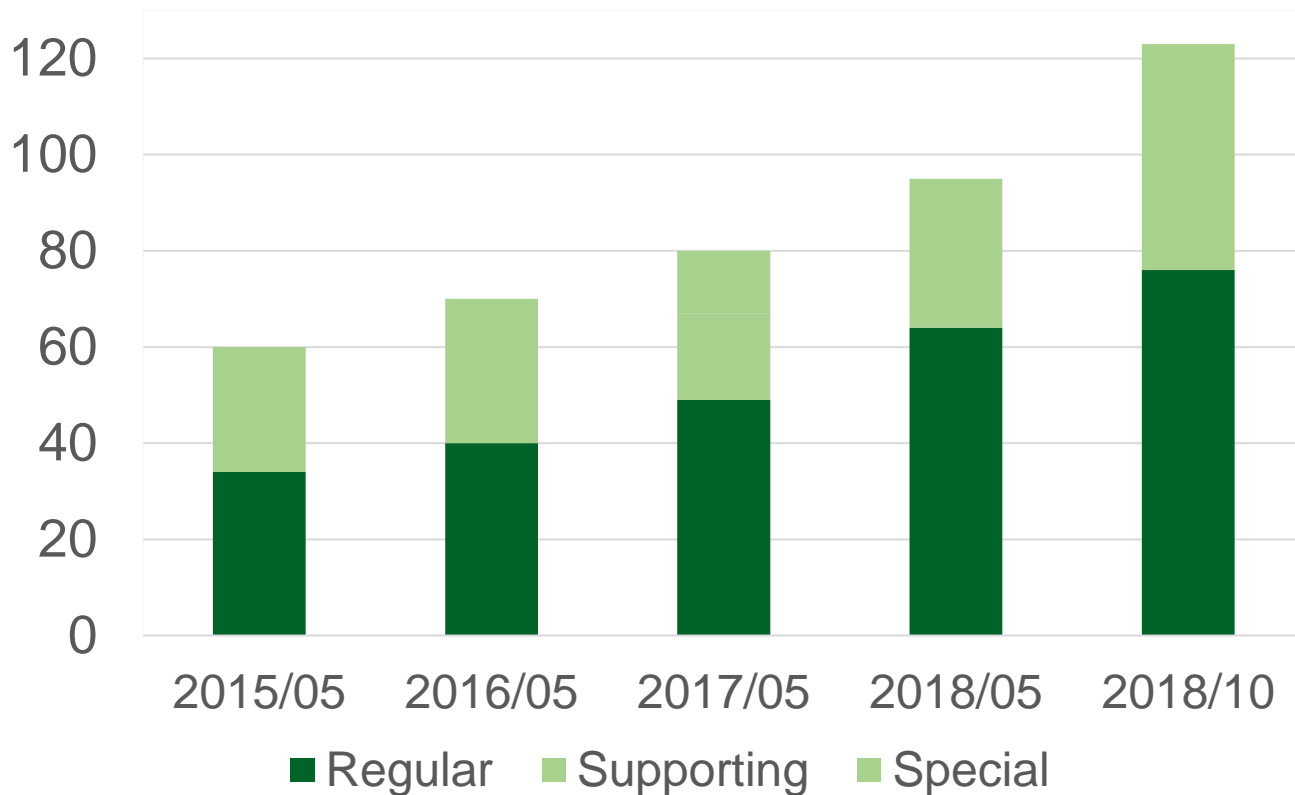
CHAdemo members in Europe

123

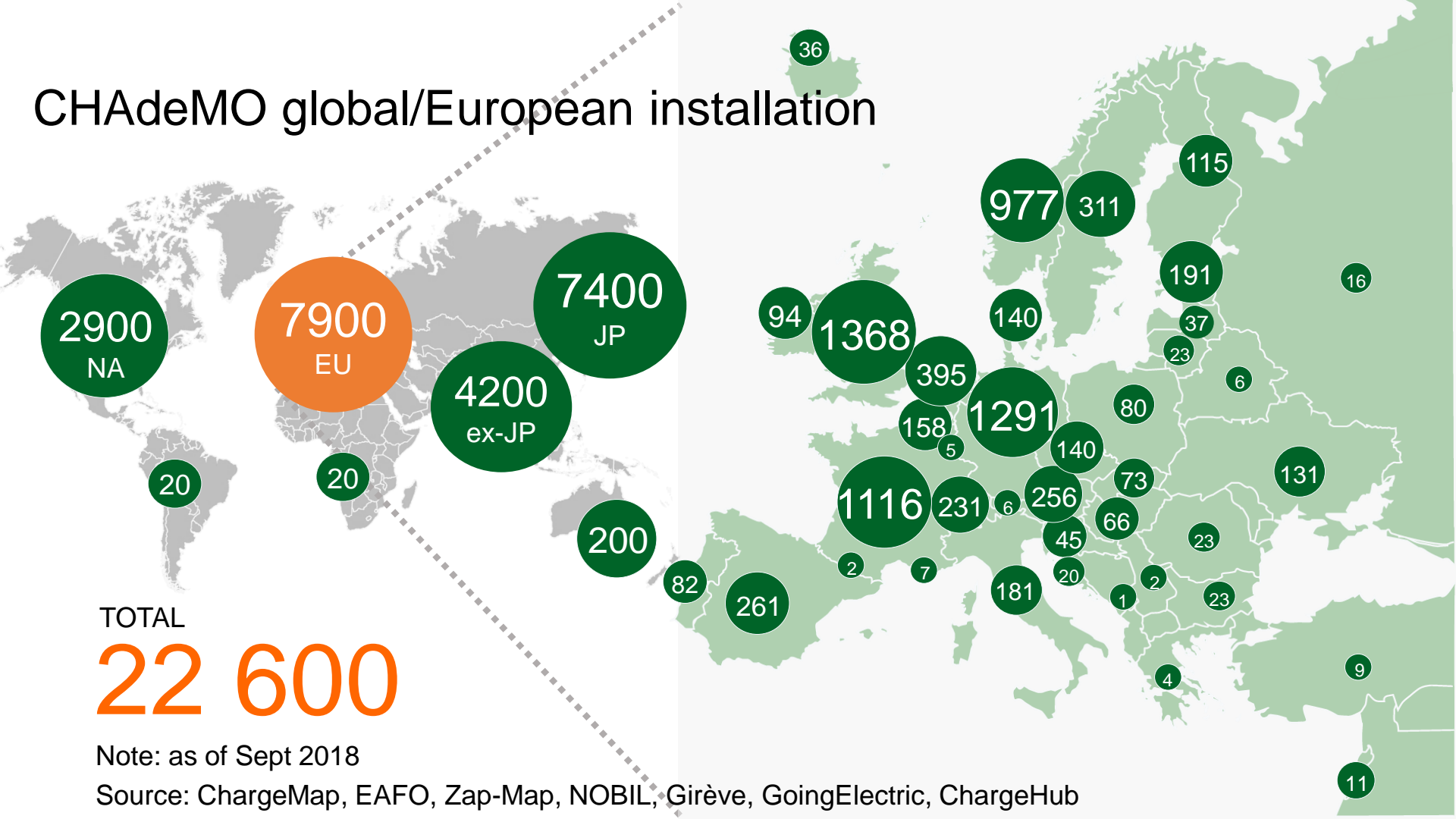
EU members

26

Countries

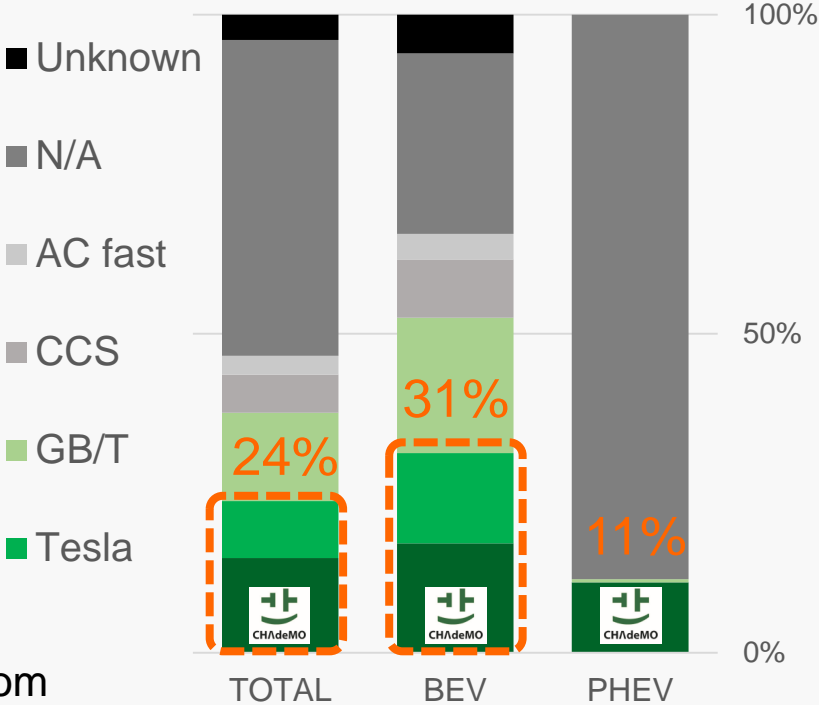


CHAdemo global/European installation



CHAdemoMO plug-in share in the world

Global plug-in sales by fast charging inlet (2008-2018/6)

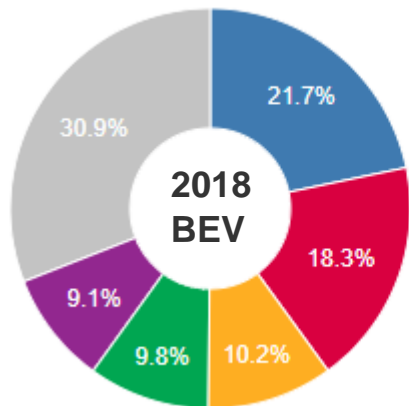


Source: EV-volumes.com

Note: includes light commercial vehicles

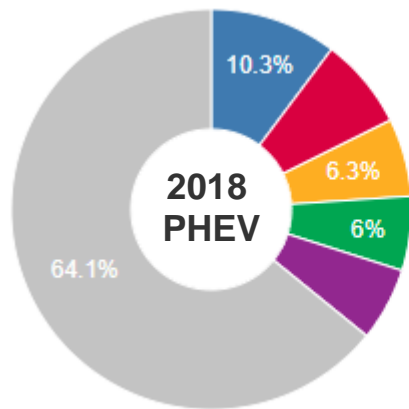


CHAdemo in the EU EV market



- Nissan Leaf
- Renault Zoe
- Volkswagen e-Golf
- BMW i3
- Tesla Model S
- Others

Top 5 BEV

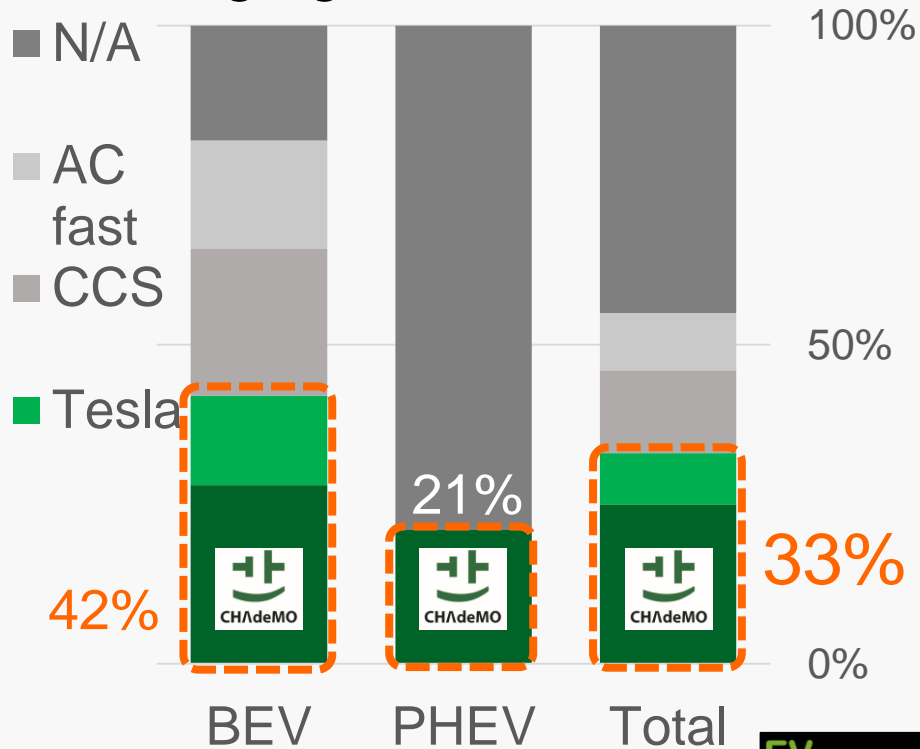


- Mitsubishi Outlander PHEV
- Volkswagen Passat GTE
- Volvo XC60 PHEV
- BMW 225xe Active Tourer
- Volkswagen Golf GTE
- Others

Top 5 PHEV

EU plug-in share by fast charging inlet

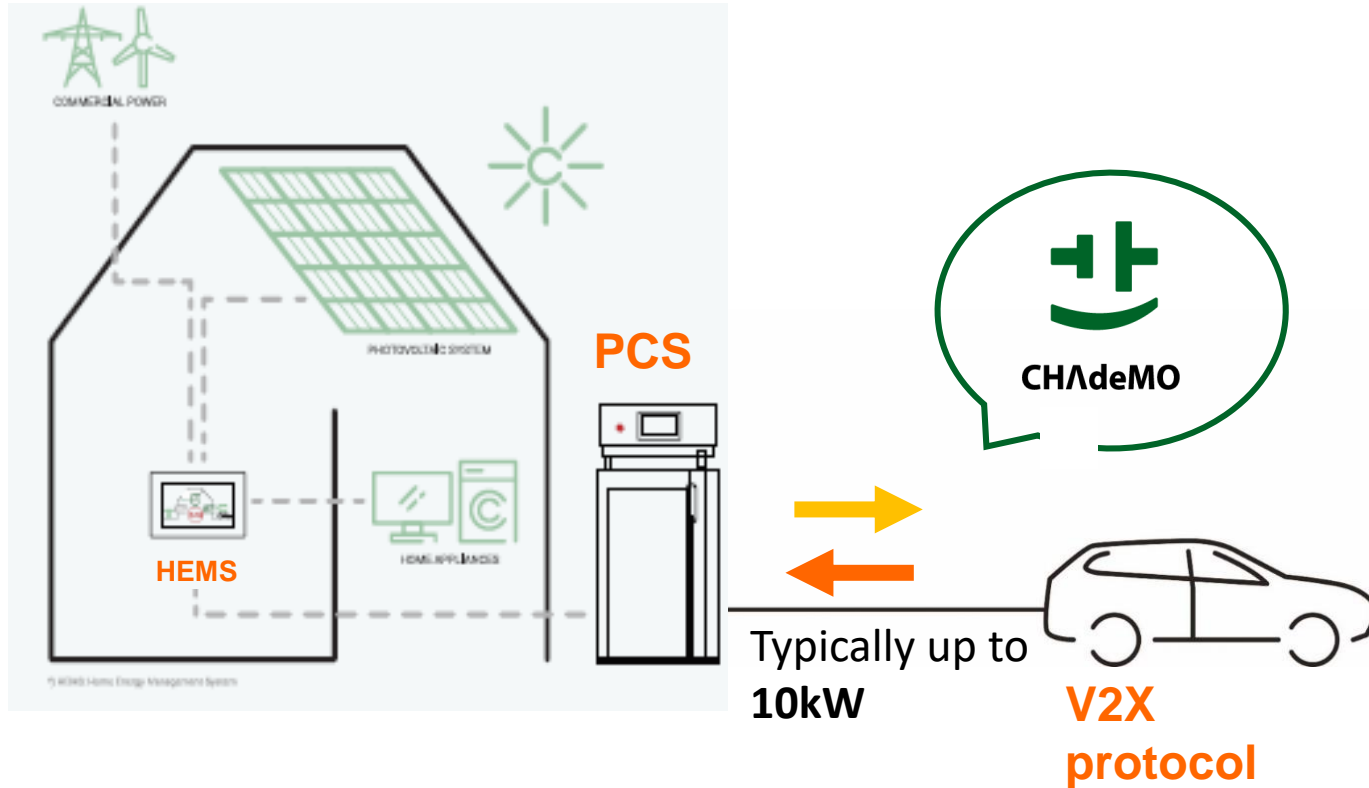
(Cumulative, 2008-2018/H1)



Source: EAFO, passenger cars only; EU+EFTA+Turkey

Source: EV-volumes.com; includes LCVs

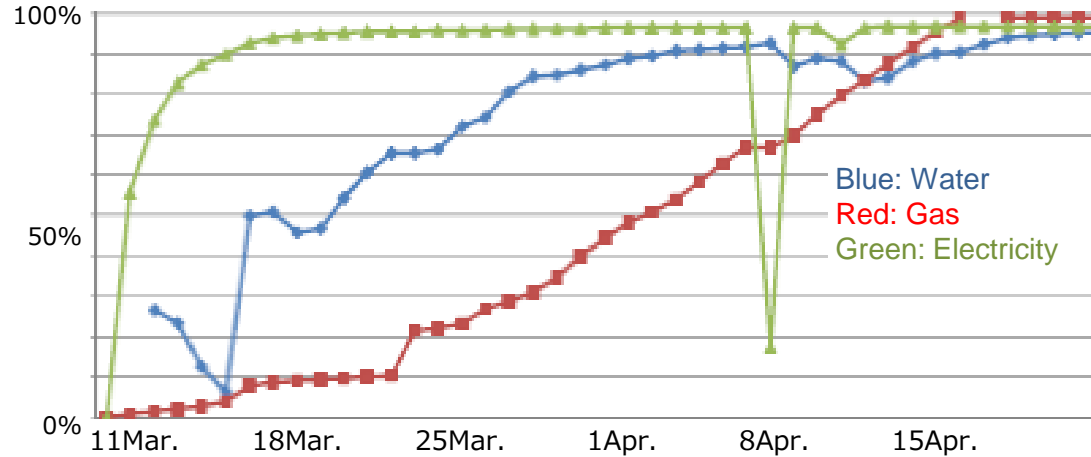
CHAdemo V2X



CHAdemo and V2X: the beginning (1/2)

Restoration of infrastructures post East Japan Earthquake (2011)

Restoration Ratio



Source: N. Nojima, JSCE



EV in Tohoku after the East Japan Earthquake
(Photo: K. Kawada)



ICE cars needed petrol, which took time to arrive at the affected areas

CHAdemo and V2X: the beginning (2/2)

Heating



Kettle (700-1000W)



Electric blankets
(50W-90W)

Information access



Phone charging
(15W/phone)



Portable PC
(50W-150W)

Recovery support



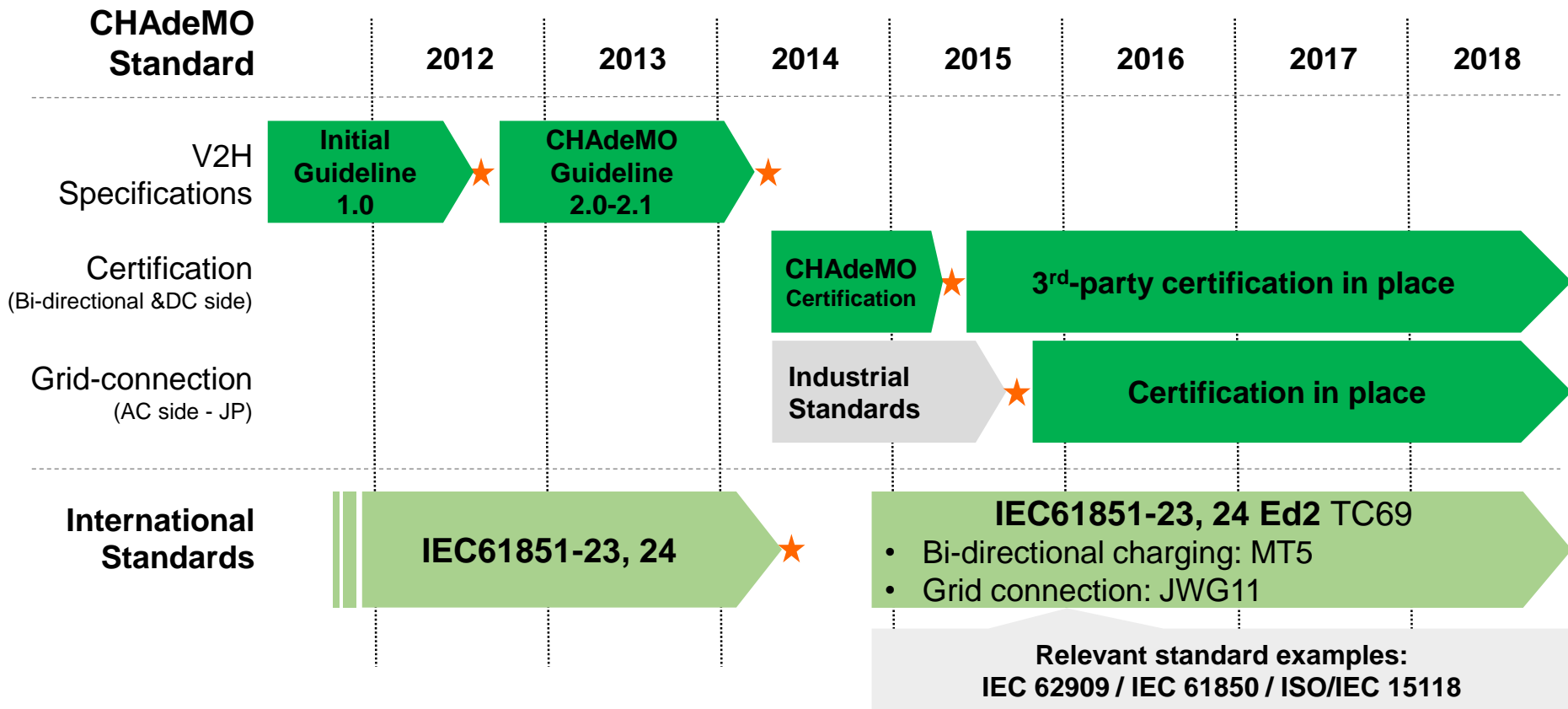
LED floodlight (70W)



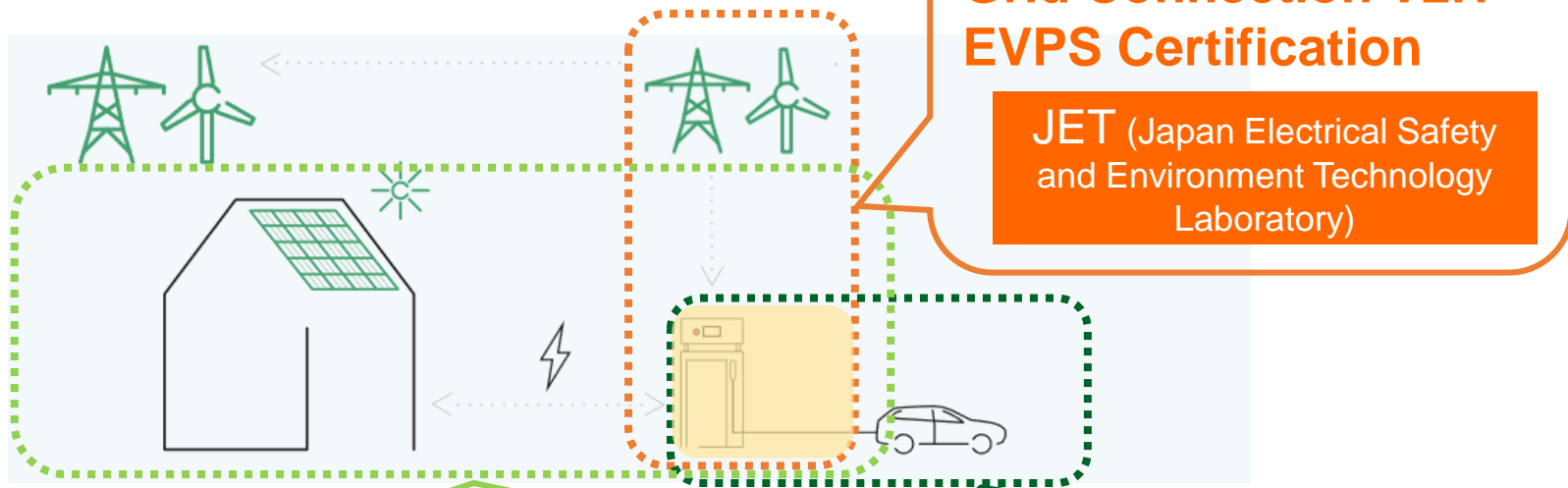
LED electric signs (200W)



Standardised V2X: specs and certification in place



Certification in Japan



Grid Connection V2H-EVPS Certification

JET (Japan Electrical Safety and Environment Technology Laboratory)

Home/Grid Communication Certification

- Defined by relevant industrial organisations (ECHONET / ECHONET Light / BACnet)

CHAdeMO V2H Certification

- EVSE-EV communication
- EV-interactive sequence control for interoperability

Source: JET <http://www.jet.or.jp/>;
https://echonet.jp/about/certification_system/

V2X products in the market

V2V (Vehicle)



V2L (Load)



V2H (Home-off Grid)



V2G/B/H (Grid)



Seen at eMove360



eNovates /the New Motion:
wall-mountable V2G (10kW)



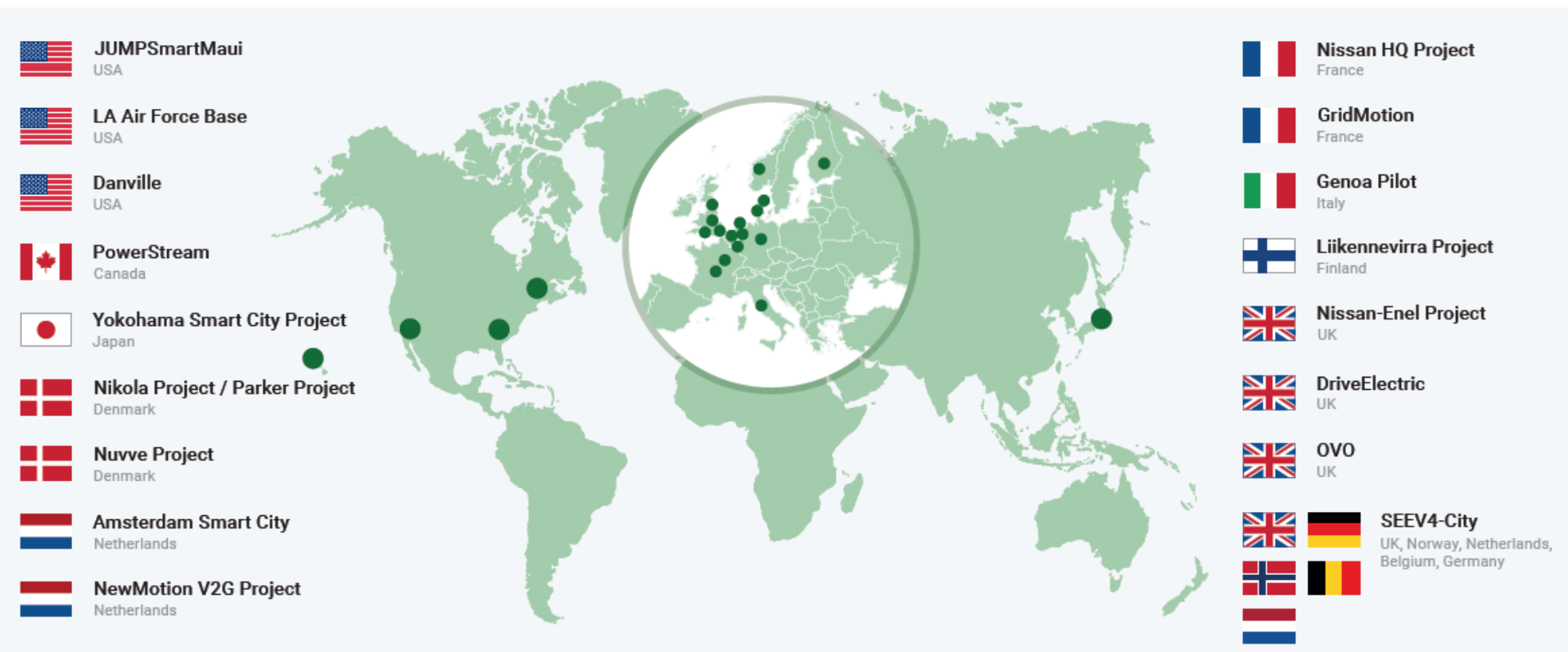
Magnum Cap: MC V2G
(10kW)



Wallbox: DC V2X charger
(7.4kW)

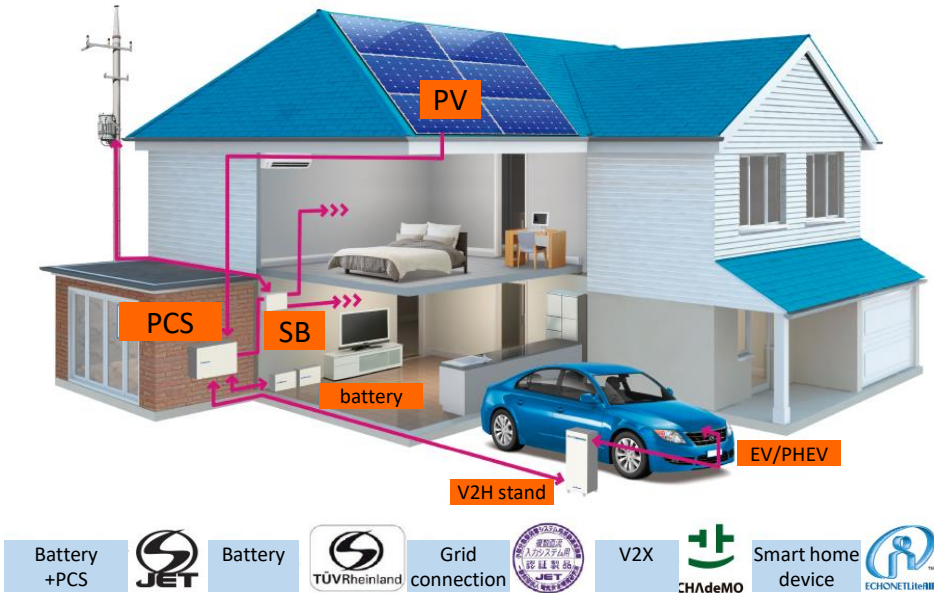
Photo courtesy of Narcis Vidal, Enel X

Grid-integrated EVs: demo to commercial applications



V2X Market trend: multi-source systems

Multi-source system for homes



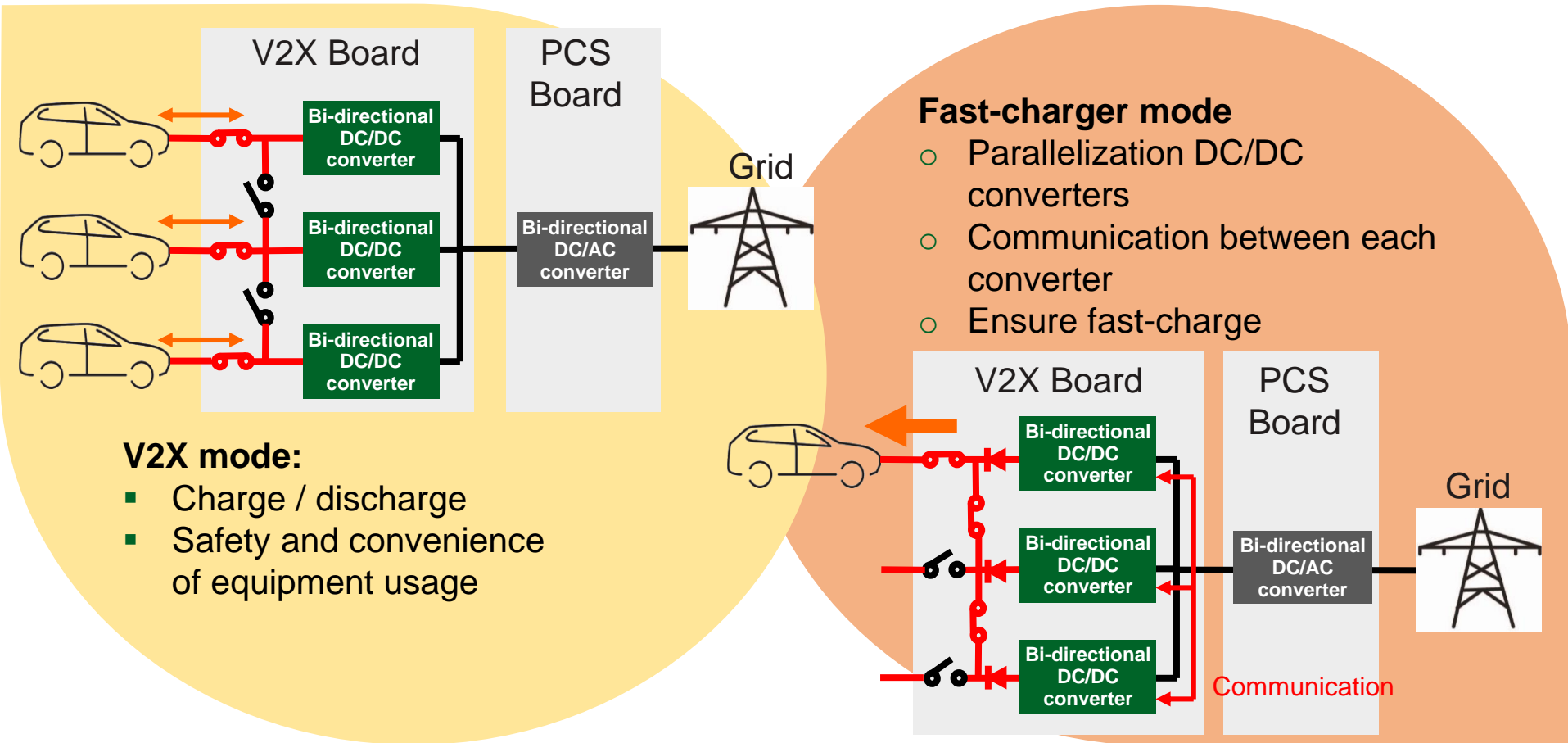
Source: Nichicon

Large-scale multi-source system



Source: TU Delft and Last Mile Solutions, PRE Power Developers

Development in progress: fast-charge on V2X system



CHAdemo principles for evolution

- **A**daptation (**a**s flexible as possible)
- **B**ackward compatibility
- **C**ore values

Adaptation (**a**s flexible as possible)

DC charge at home/office
(6-10kW)

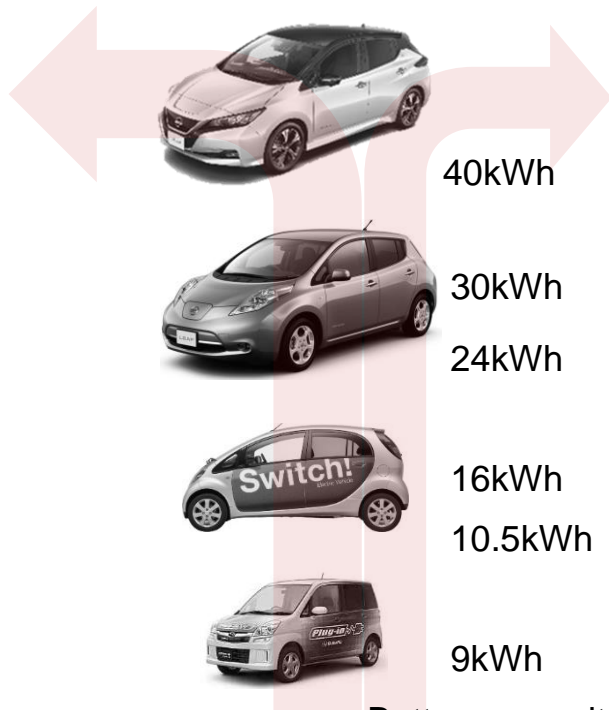


Enhanced V2X
Functionality



Battery as energy device

- Peak cut
- PV connection
- VPP participation
- Resilience
- Leisure



Battery capacity

High Power Charging
(50kW+)



Varied charge
needs

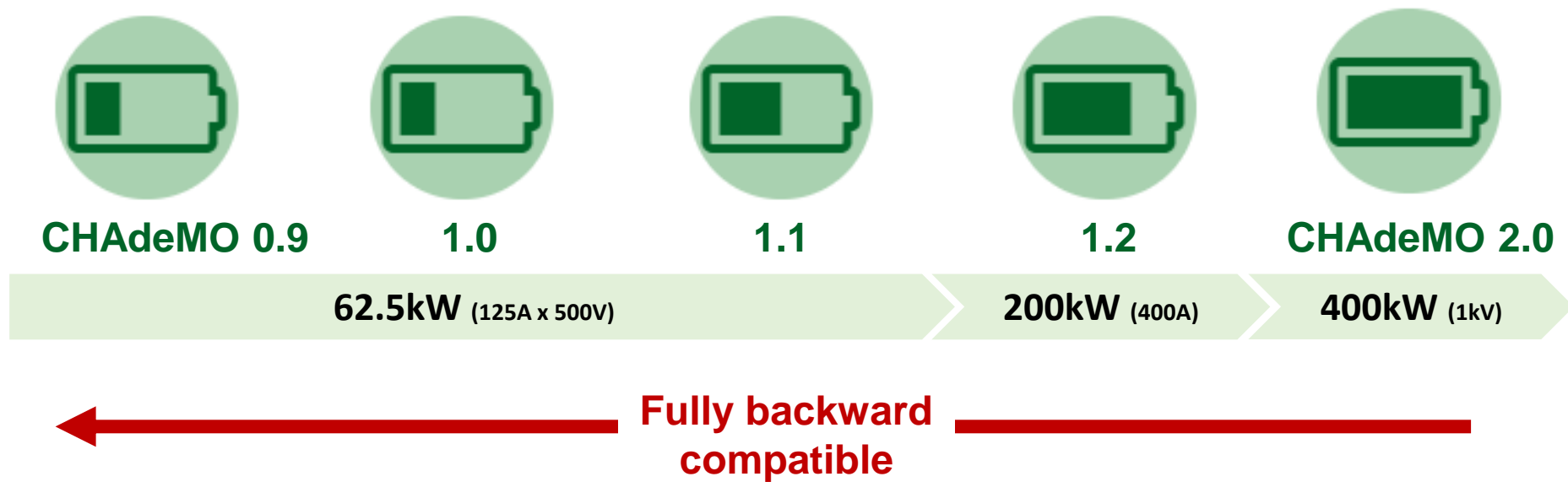


Varied charge needs

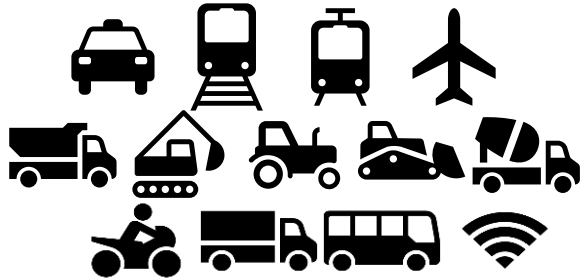
(22kW, 50kW, inductive, smart charge..)

- Full charge
- Top-up
- During stay
- Low Power (low cost)
- Charge guided by AI

Backward compatibility



Core values: safety, CAN, interoperability



New techno
High power/voltage, V2X,
PnC, Smart Charging..



Compliant variants

CHAdemo Core
Safety / Communication
protocol / Certification...

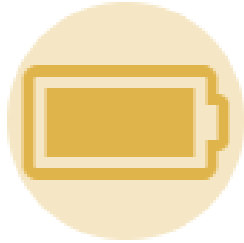
Regional variants



CHAdemo
(THE ORIGINAL)



Next-gen ultra-fast protocol: harmonisation with GB/T



New protocol

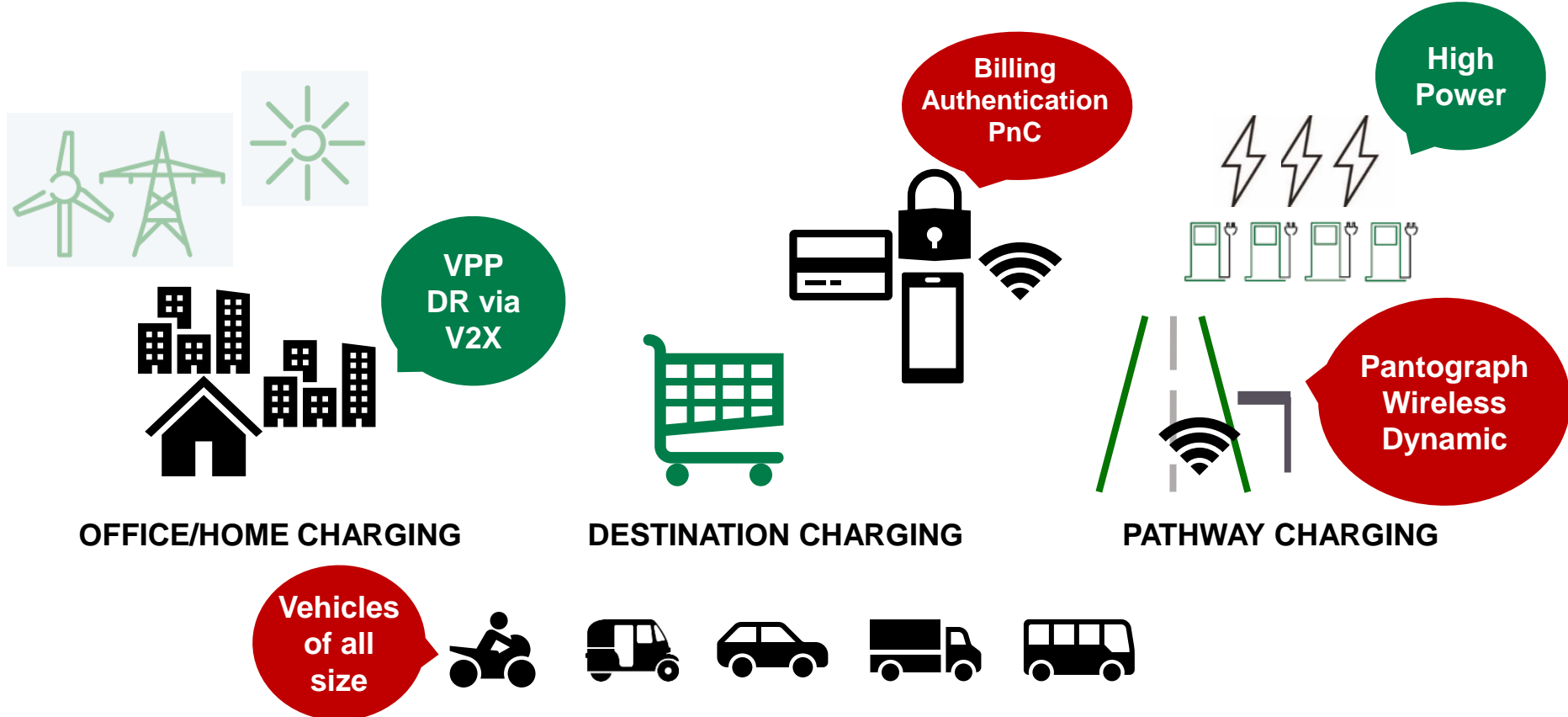
Target 900kW
(600A x 1.5kV)

- Co-development with CEC (China Electricity Council)
- For vehicles including **trucks**, **buses** and **passenger vehicles**



- New connector shape
- **Full backward compatibility** with current CHAdeMO and current GB/T
- Aimed for 2020
- V2X included in scope

All possible with CHAdeMO



Summary

- CHAdeMO is the first and the only international protocol to enable V2X with production EVs / PCS
- Having engaged in a variety of demo and commercial projects, CHAdeMO leads the innovation in the V2X domain
- CHAdeMO protocol evolves and optimises functionality adapting to the various market needs around charging / discharging



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