



DC V2X systems: advantages and evolution

Lyon, 20 May 2019

Tomoko BLECH

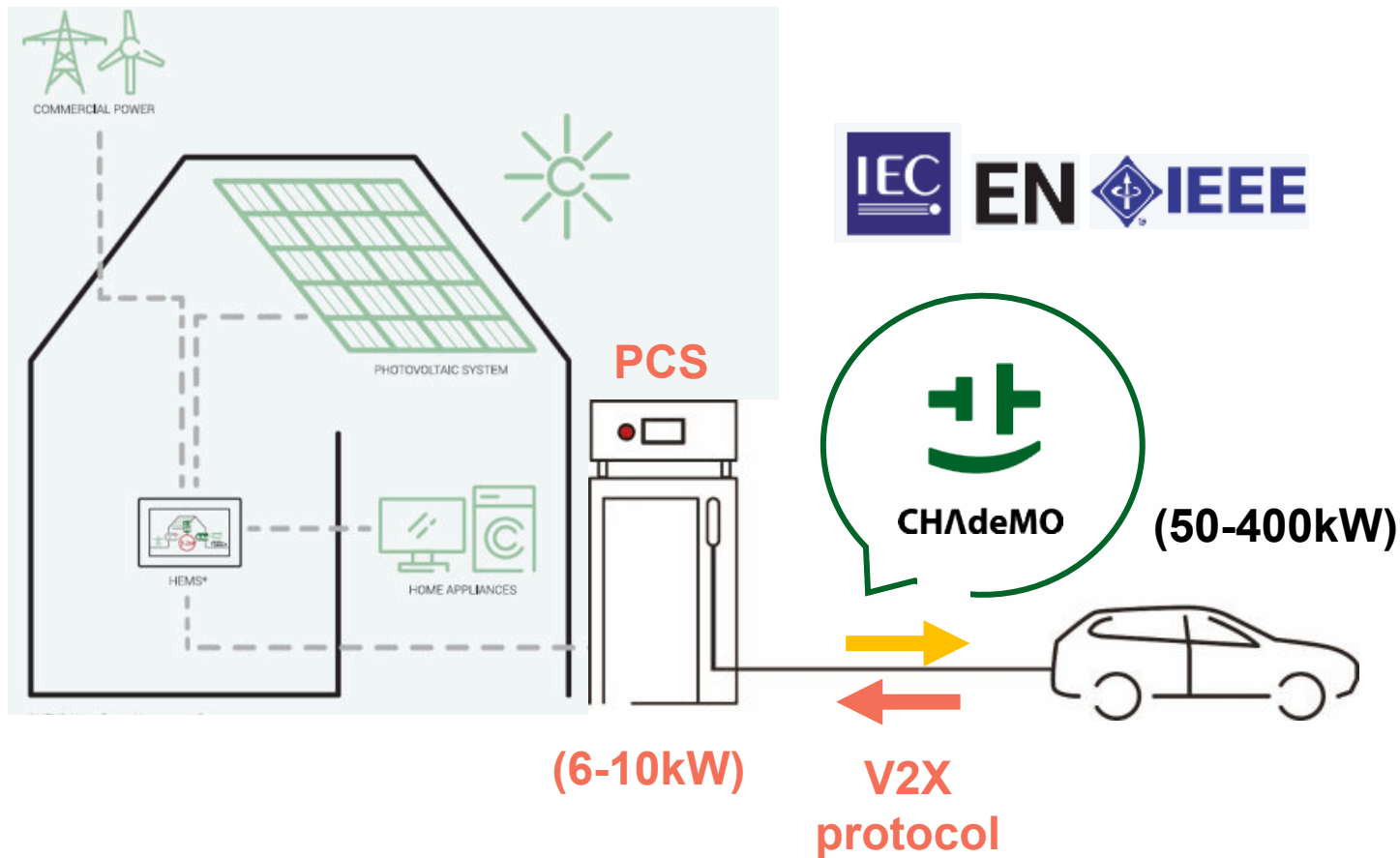
# Agenda



- CHAdeMO basics and V2X
- International standardisation
- AC/DC system comparison
- Product R&D trend
  - Category
  - Trends
- Summary



# CHAdeMO and CHAdeMO Association



**CHAdeMO  
Association**



# Association members



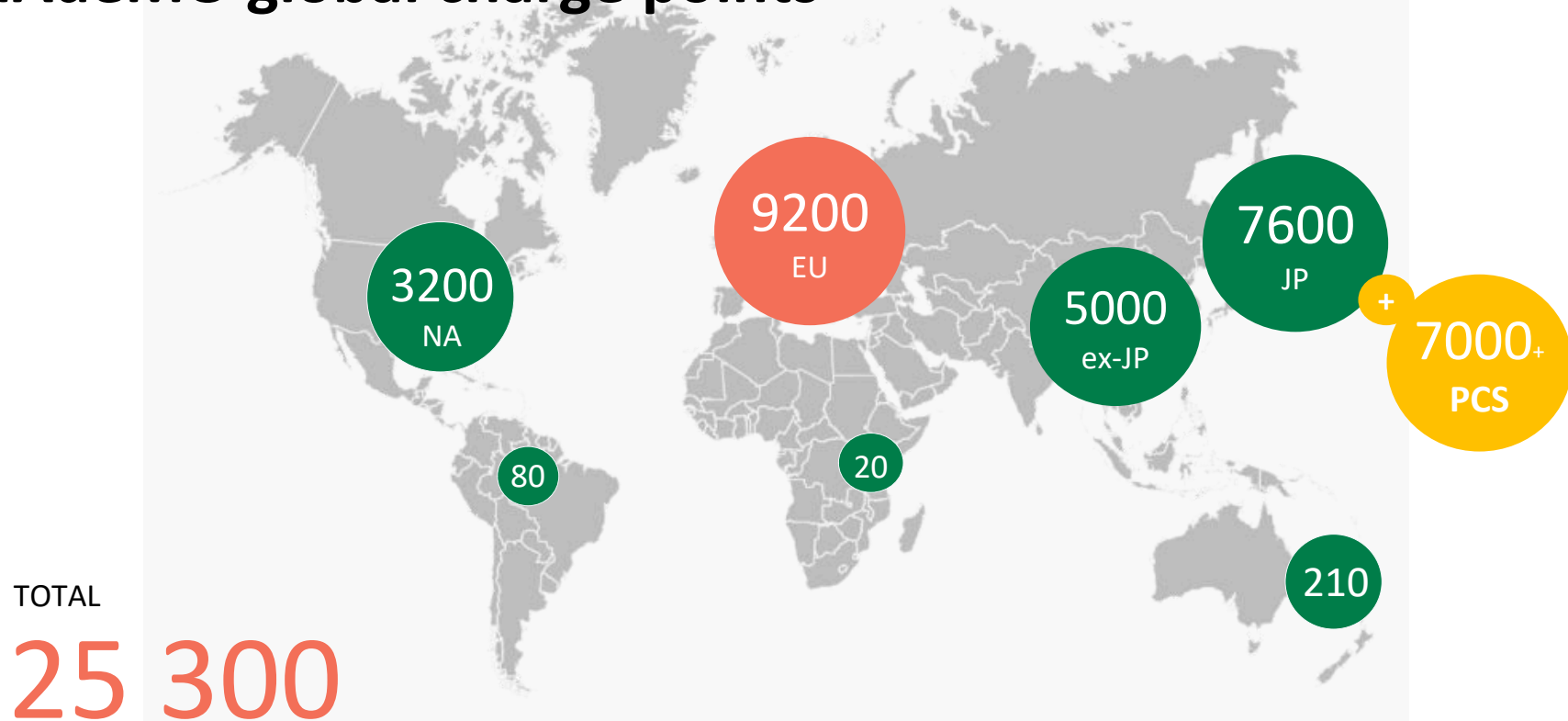
Our  
members:

430  
entities

from  
41  
countries

And many, many more..

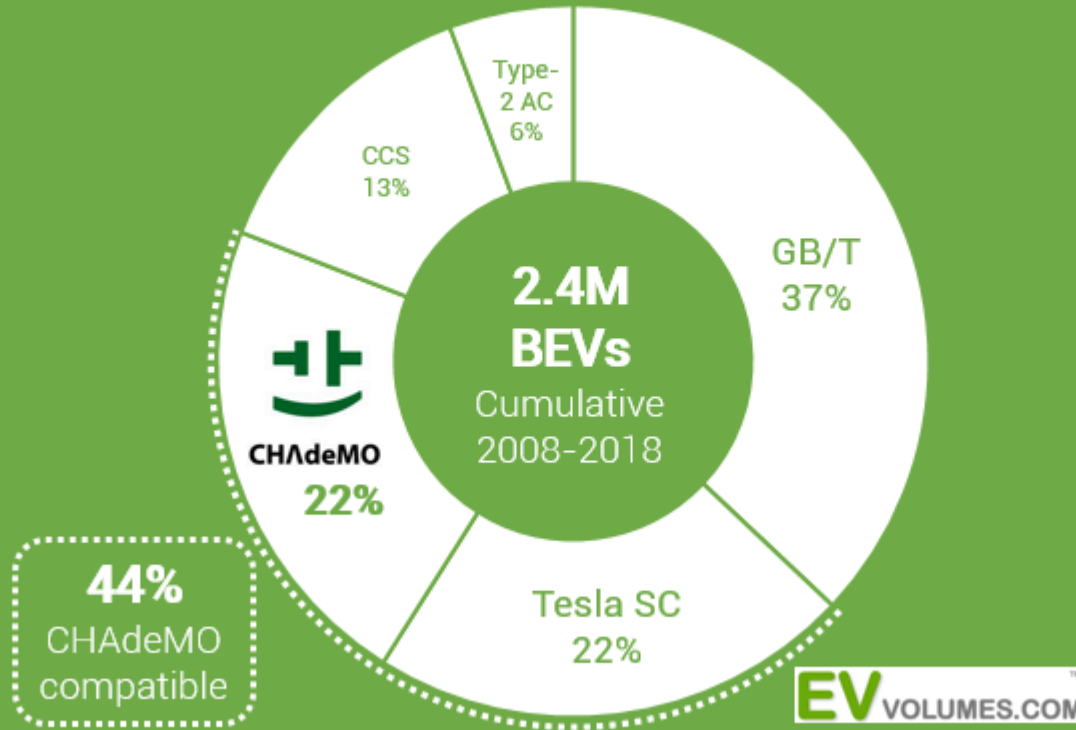
# CHAdeMO global charge points



Note: as of April 2019; not exhaustive; not including V2H systems

Source: ChargeMap, EAFO, Zap-Map, NOBIL, Girève, GoingElectric, ChargeHub

## GLOBAL FAST-CHARGEABLE BEV INLET SHARE



Source: EV-volumes.com; BEVs only, excluding non fast-chargeable BEVs (33%)



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# International standards and smart charging requirements



GB/T  
(PRC)



CHAdeMO  
(Japan)



CCS Combo1  
(US)



CCS Combo2  
(DE)



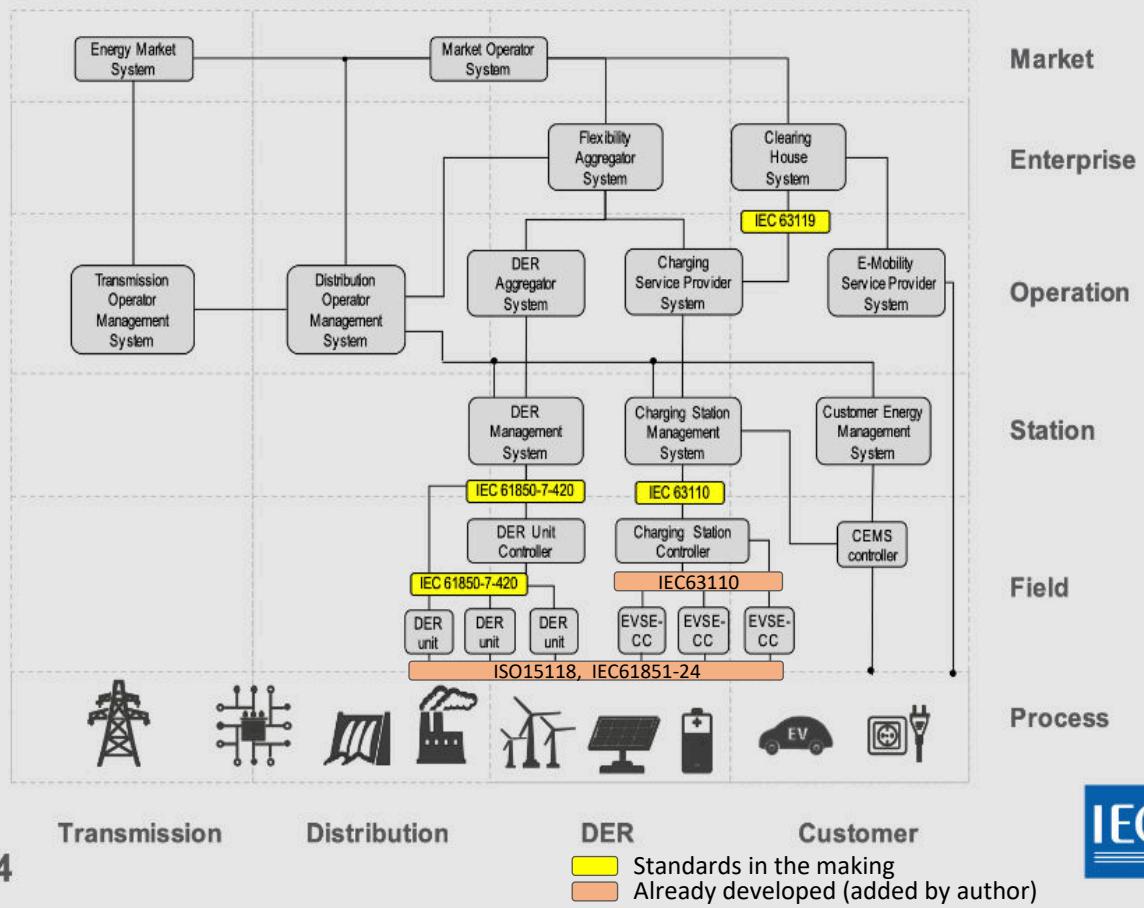
AC/DC Mono- directional	IEC 61851 (2014) ✓	IEC61851 (2014) ✓	ISO 15118 Ed1 (2014) ✓	ISO 15118 Ed1 (2014) ✓
DC bi- directional	Merging with CHAdeMO (2021)	CHAdeMO V2X (2014); IEC 62909-2 (2019) ✓	CCS (EU+US) + ISO/IEC 15118-20 (to be published in 2019)	
AC bi- directional	N/A (DC only)	N/A (DC only)	Bidirectional OBC (on-board charger) + ISO/IEC 15118-20 + IEC61851 Ed4 (to be started)	



# V2X and energy market

## SGAM information layer

Revision 2018-11-09



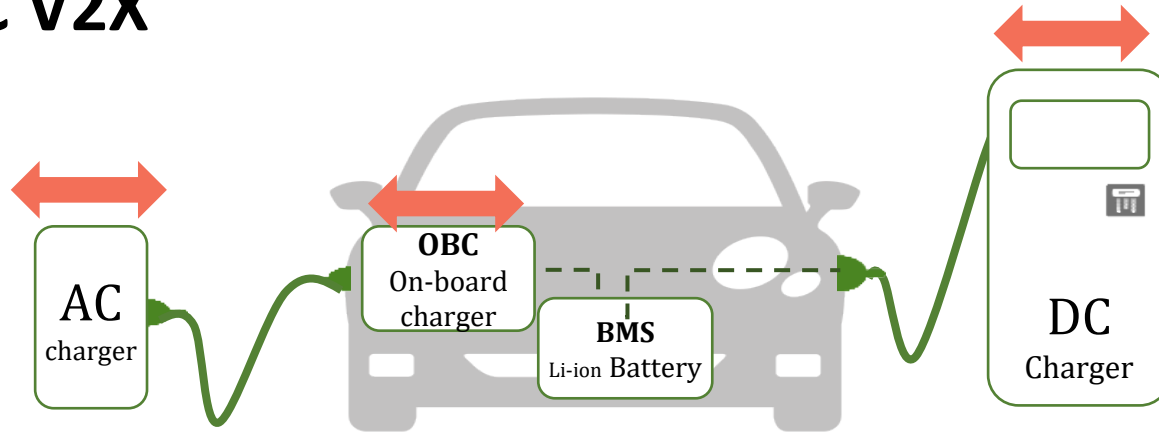


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# AC / DC V2X



## AC V2X

- Low power, slower charge
- Simple, easy, economic charger\*
- More expensive (and heavier) EV\*
- V2G in all locations when parked, but a challenge for DSOs
- More difficult to meet all grid requirements

## DC V2X

- Faster with higher power
- Complicated, bigger, pricy charger\*
- Less expensive (and lighter) EV\*
- Greater scalability and service options → financial returns\*
- Greater electrical safety, grid requirements easier to meet
- Direct solar, less loss



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# V2X products in the market

## V2V (Vehicle)



## V2L (Load)



## V2H (Home-off Grid)

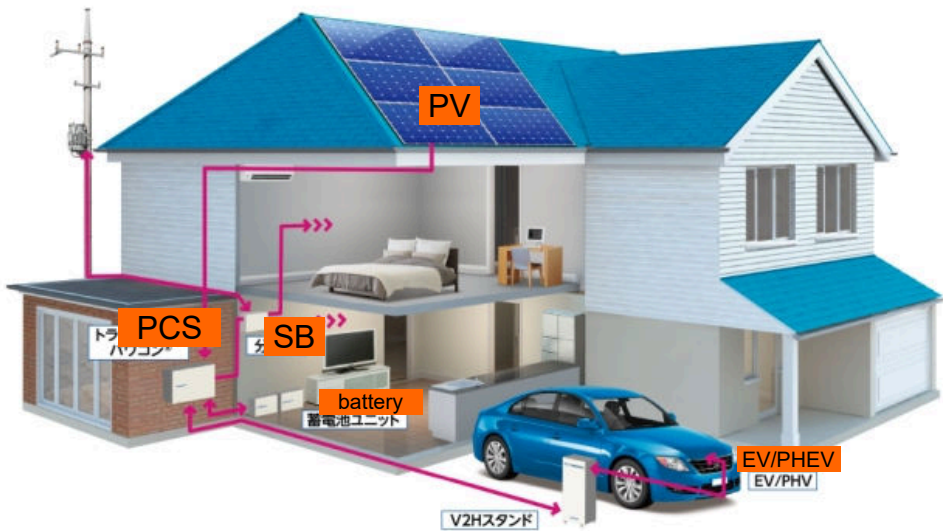


## V2G/B/H (Grid)



# V2X Market trend 1: high-end multi-source systems

## Multi-source system for homes



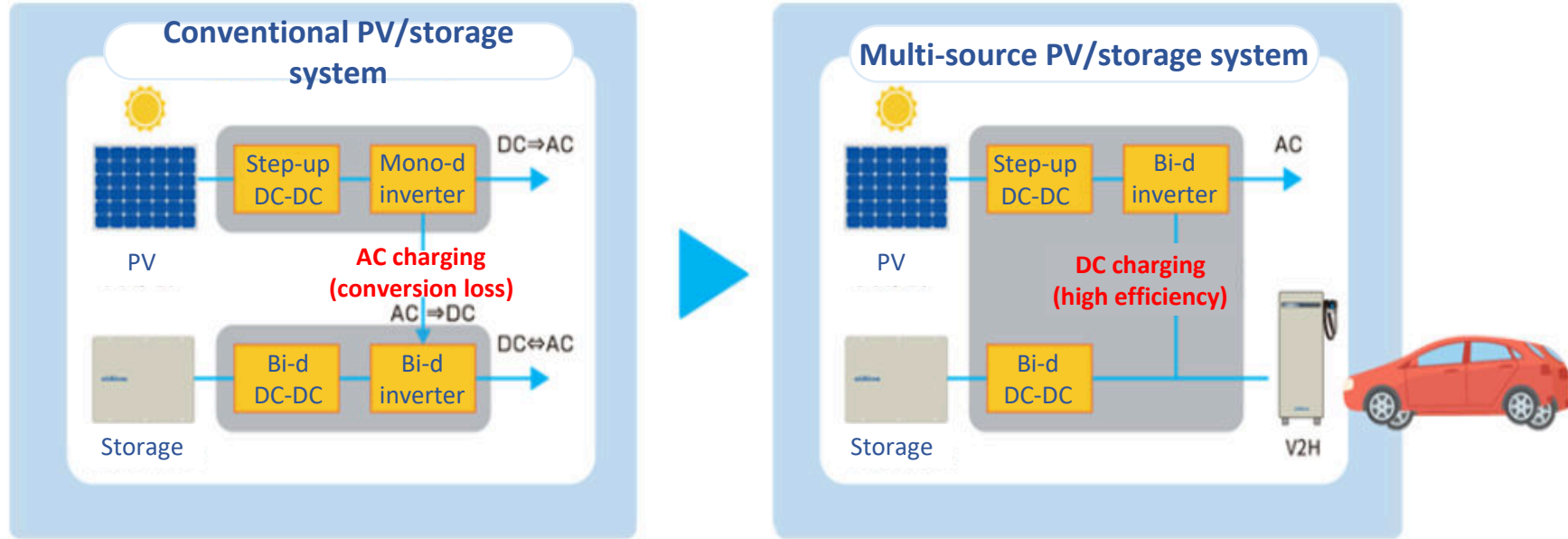
Source: Nichicon

## Large-scale multi-source system



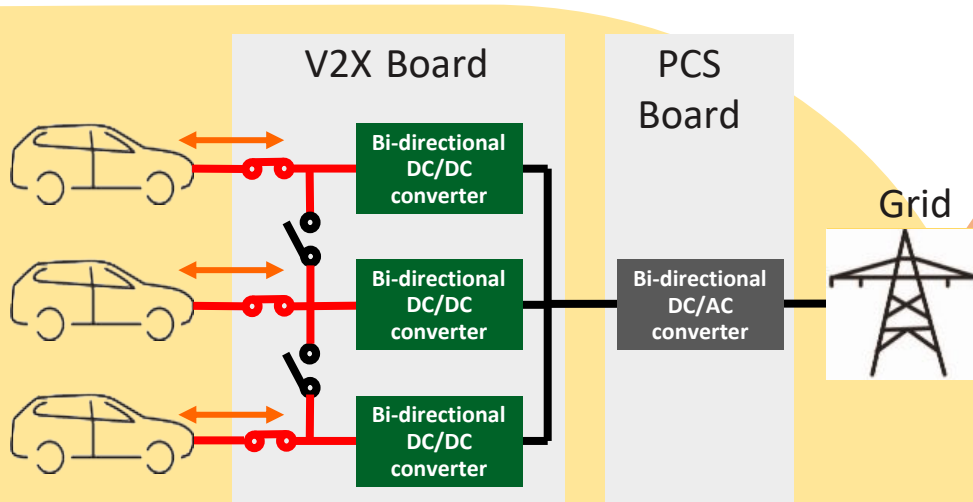
Source: TU Delft and Last Mile Solutions,  
PRE Power Developers

# How it works: avoiding conversion (and taxation) losses



Source: Nichicon

# Development in progress: fast-charge on V2X system

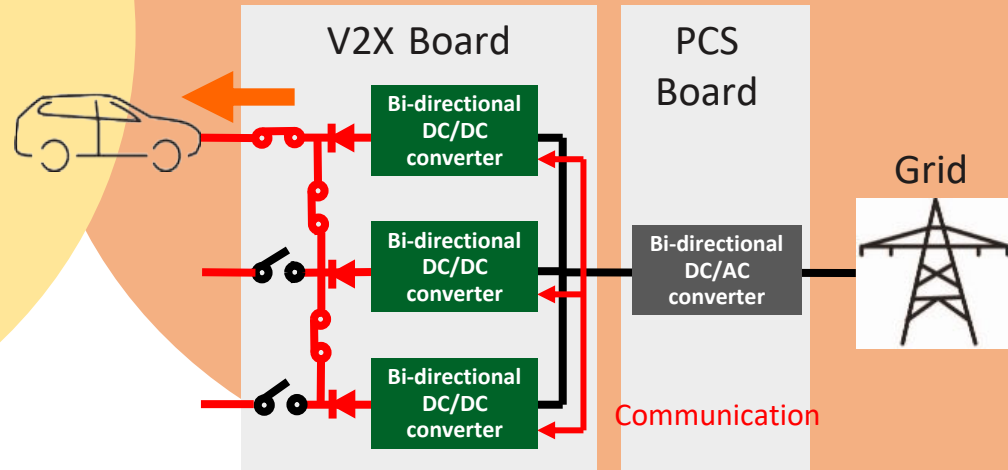


## V2X mode:

- Charge / discharge
- Safety and convenience of equipment usage

## Fast-charger mode

- Parallelisation DC/DC converters
- Communication between each converter
- Ensure fast-charge





# V2X Market trend 2: more affordable and compact PCS



**eNovates /the New Motion**  
Wall-mountable V2G (10kW)



**OVO/Indra**  
V2G for home(6kW)



**Wallbox**  
DC V2G (7.4kW)

Photo courtesy of  
Narcis Vidal, Enel X

# Grid-integrated EVs: demo to commercial applications

 JUMPSmartMaui  
USA

 LA Air Force Base  
USA

 UCSD  
USA

 PowerStream  
Canada

 Yokohama Smart  
City Project  
Japan

 Nikola Project /  
Parker Project  
Denmark

 Nuvve Project  
Denmark

 Amsterdam Smart City  
Netherlands

 NewMotion V2G Project  
Netherlands

 GrowSmarter  
Spain

 Nissan HQ Project  
France

 GridMotion  
France

 Genoa Pilot  
Italy

 SuviLahti Pilot  
Finland

 Nissan-Enel Project  
UK

 DriveElectric  
UK

 OVO  
UK

 Redispatch V2G  
Germany

 SEEV4-City  
UK

 Norway  
 Netherlands  
 Belgium  
 Germany





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# Summary



- CHAdeMO is the only enabler of V2X with production EVs/PCS readily available
- More V2X product options are increasingly becoming available both high-end and affordable models
- To reduce the price and accelerate V2X adoption, more AC/DC V2X products are awaited, although some standardisation work remains



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