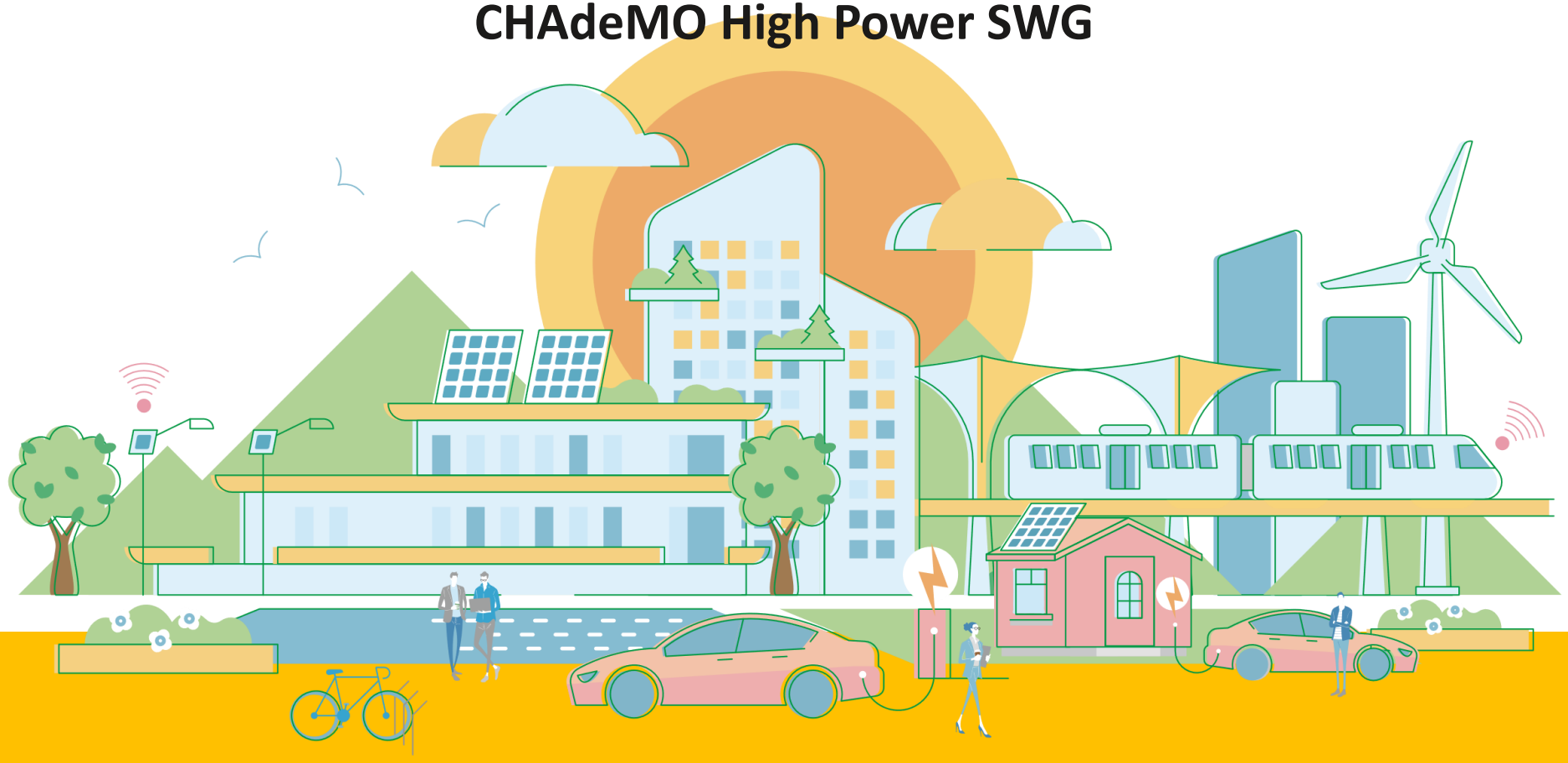
Development trends of trucks and buses

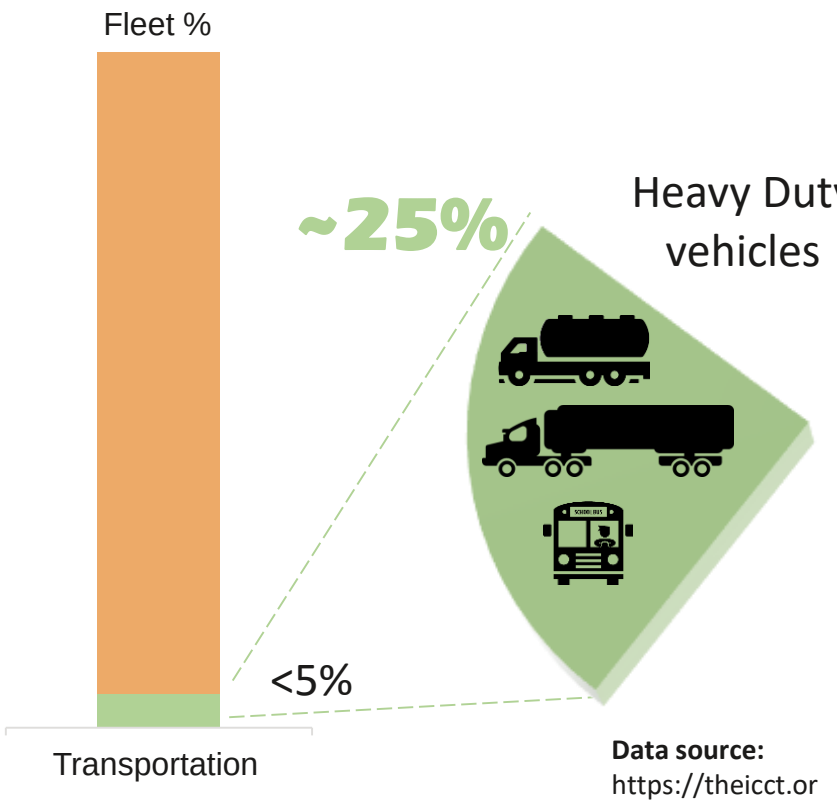
Dr. Isaias Oliva

CHAdeMO High Power SWG

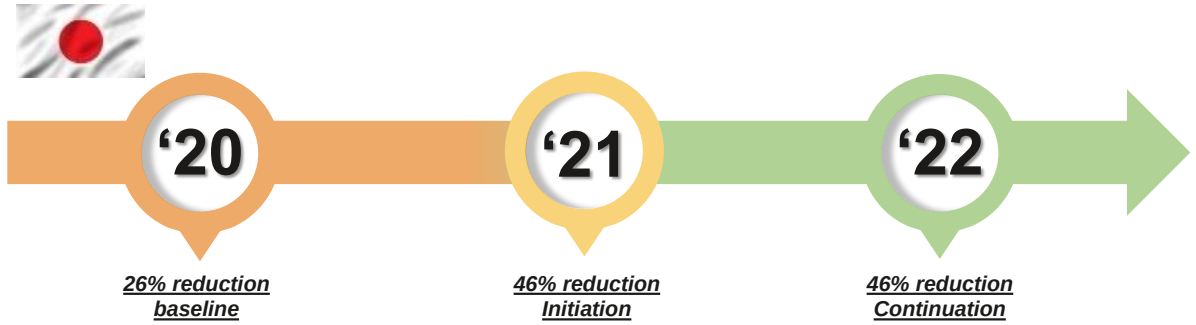


Emissions from Commercial Trucks & Buses

Available Fleet of Heavy Duties vehicle represents ~25% of the emissions by transportation sector



Data source: https://theicct.or



Goal of achieving carbon neutrality by 2050 & reducing greenhouse emissions by 46% by fiscal year 2030

EPA United States Environmental Protection Agency

EPA announces "Clean Trucks Plan" for new regulation on emission by Dec. 2022

Data source: https://www.epa.gov/

European Commission

The Regulation (EU) 2019/1242 setting CO2 emission standards for heavy-duty vehicles

https://ec.europa.eu/

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Commercial vehicles classification & transition

Commercial Vehicle Portfolio

Light Duty Segment

- Last mile delivery
- Consumer goods

Medium Duty Segment

- Construction
- Logistic

Heavy Duty Segment

- Long haul
- Bulk freight

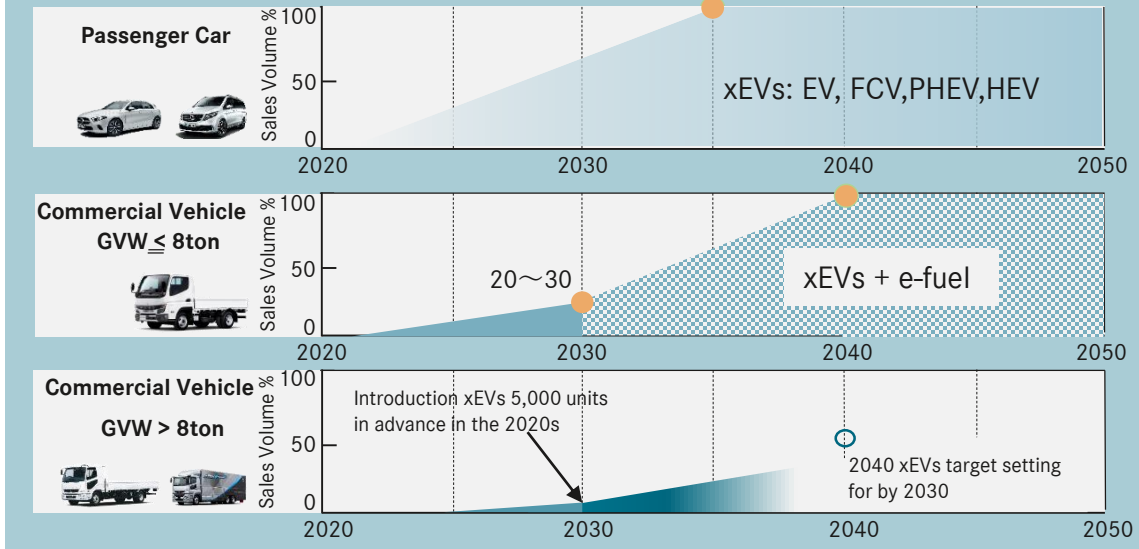
Bus

- Intracity
- Intercity

Carbon Neutrality Approach & Green Growth Strategy

Timeline & Targets

- GHG ▲46% reduction vs 2013 by 2030
- Carbon neutral by 2050



Light Duty vehicle

Range	~ 200km
Battery Topology	Multi battery
Battery Capacity	~ 100kWh
Battery Voltage	400V → 800V
Charging Need	Overnight
Charging Type	AC & DC
V2x	Required

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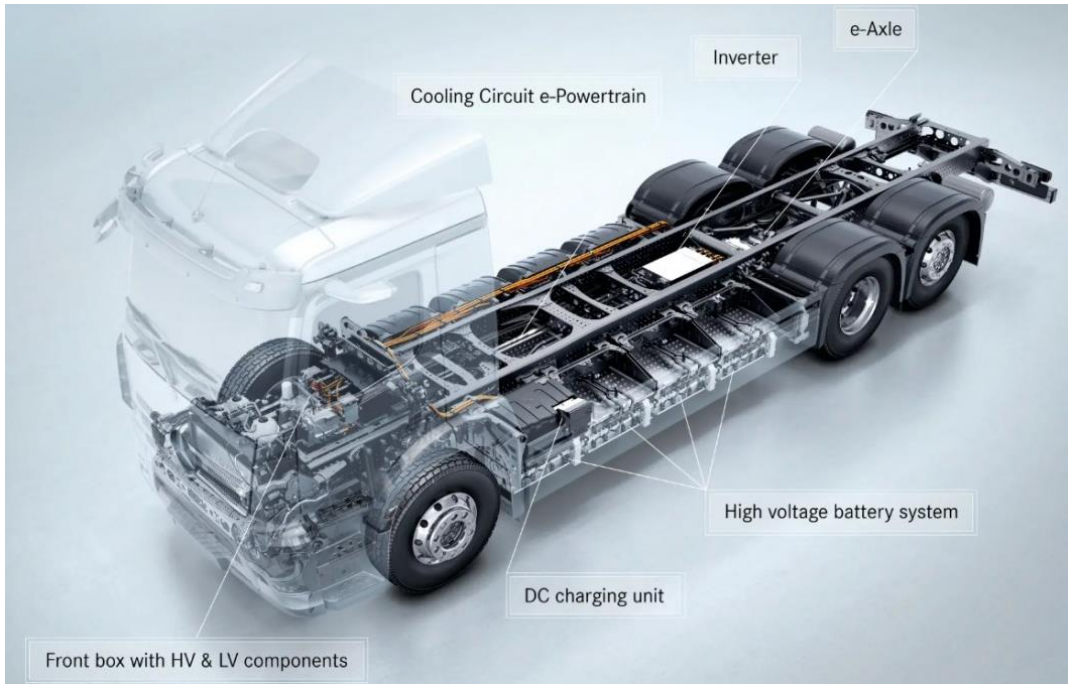
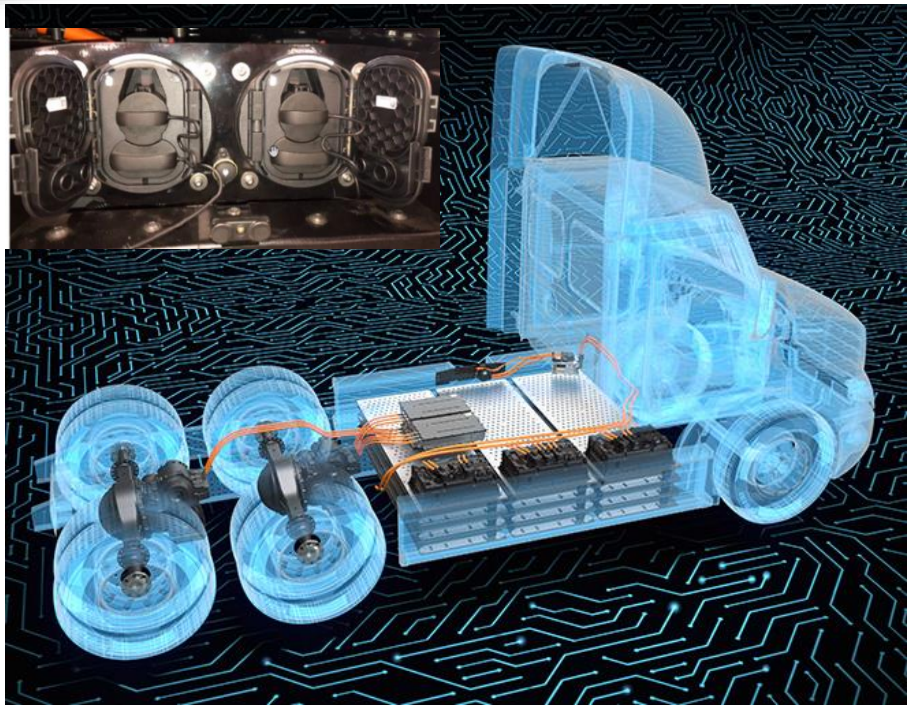
Heavy Duty Vehicle



Range	+ 300km
Battery Topology	Multi battery
Battery Capacity	~ 500kWh



Battery Voltage	400V → **800V**
Charging Need	Opportunity charging
Charging Type	DC (single or dual)

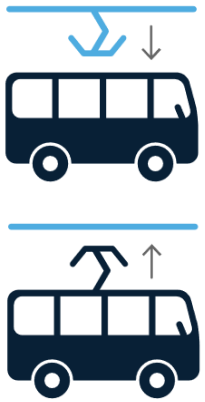
Buses

Feature | V2x

"We are committed to working with utilities and other stakeholders to create a V2X solution that supports the utility grid and our operations. We believe that school buses are ideally suited to do just that."

Data source:
Memorandum of Understanding to Establish the Vehicle-to-Everything Collaboration (energy.gov)

Charging Type | Pantograph



- Convenient ACD concept to allow high power charging on vehicles.
- Flexibility to implement either by "Pole mounted" or "Roof mounted" as per the requirements of the customers

Data source:
https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-european-electric-bus-market-is-charging-ahead-but-how-will-it-develop

MCS

Charging Levels

CCS DC charging

1000V

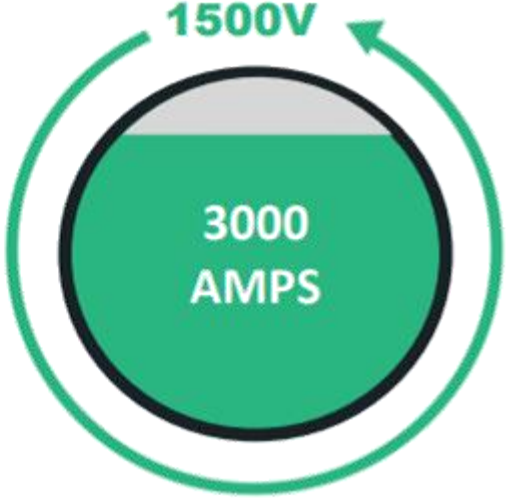
CCS can deliver up to around 200Amps with traditional copper cables, while higher currents are delivered via cooled cables.

Up to 80% of 100kWh battery in less than 20 minutes

Up to 350kW power delivery, Some units up to 500kW

Commercial Vehicle High Power (proposed)

1500V



The High Power Commercial Vehicle charging standard would allow users to recharge their large, commercial vehicles (Classes 6, 7 & 8) in 20-30 minutes.

Up to 80% of Class 8 truck, carrying 500kWh, in 20 minutes

Up to 4.5 MW power delivery

Data source:
CharIn Association Press Release

“The batteries of the production eActros LongHaul can be charged from 20 to 80% in well under 30 minutes at a charging station with an output of about one megawatt.”

Data source:
Battery-electric eActros LongHaul will go to Amazon and Rhenus in 2023 for real-world operation - Daimler Truck Media Site

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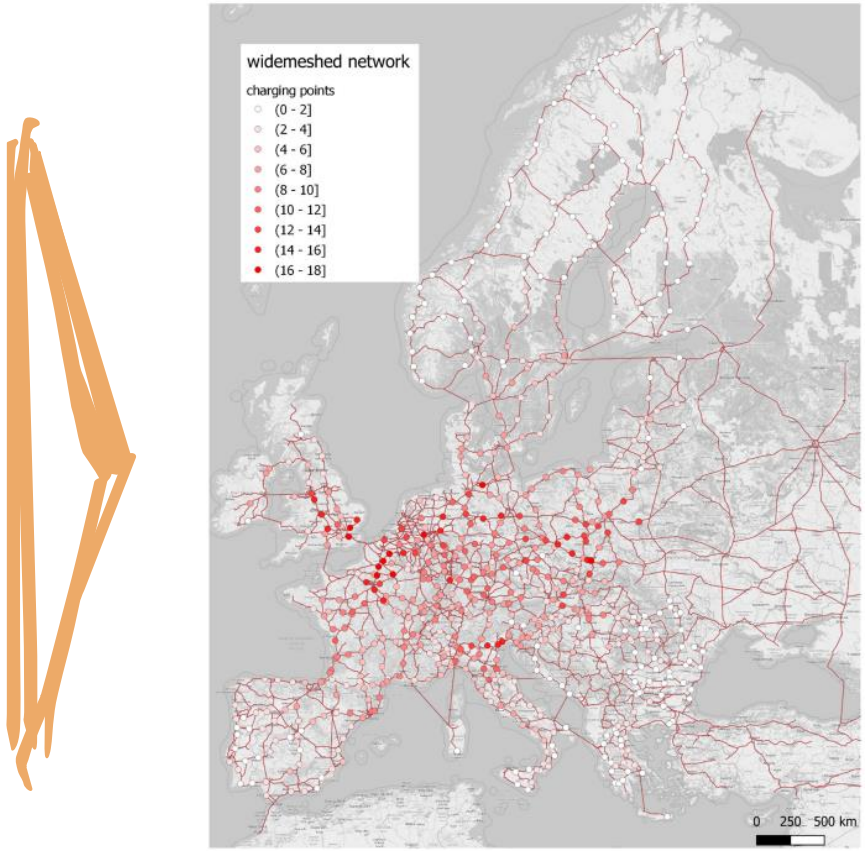
Next Step in Infrastructure (Network)

HoLa Project

Build blueprint for a nationwide expansion of charging infrastructure that charge battery-electric trucks sufficiently quickly within the statutory break times of 45 minutes between two trips

- Part 1: Planning of construction & operation of the charging sites
- Part 2: Demonstration
- Part 3: Monitoring & Field Analysis



[HoLa (hochleistungsladen-lkw.de)]

Next Step in Infrastructure (Layout)

Public electric truck charging site for HDT/MDT & LDT needs sufficient space and location to fit the vehicles

Partnership between Portland General Electric and Daimler Trucks North America

Battery Electric – Charger Development

■ **Future Target**

Based on Green Growth Strategy by government (Revised on 2nd June 2021) **150,000** charging facilities for EV in 2030 (DC: 30,000 = 4 times from the current situation)

■ **Current**

CHAdeMO-compatible charge points (end 2020): **7,700**

Of which number accessible by trucks (LDT): < **3000**

By truck available facility*	DC	AC	Total
Roadside rest areas	838	25	863
Service areas on expressway	424	7	431
Public facilities	515	285	800
Convenience stores	1047	24	1071
Gas stations	84	61	145
Total	2908	402	3310

*Best possible case from the type of facility

By output power	All facility	Truck available*
90kW or more	76	10
40-90kW	3641	832
20-40kW	3901	2039
Less than 20kW	60	27
Total	7678	2908

Data Source:
CHAdeMO Association (https://www.chademo.com)
GoGoEV (https://ev.gogo.gs) EV charging station information sharing site

Thank you for your attention