Module 3: Charging Infrastructure

Solutions+ Training

Forecasting recharging demand

Growing demand on 2022

Increasing demand of BEV passenger cars in Europe drives the need for recharging infrastructure.

Example: Netherlands

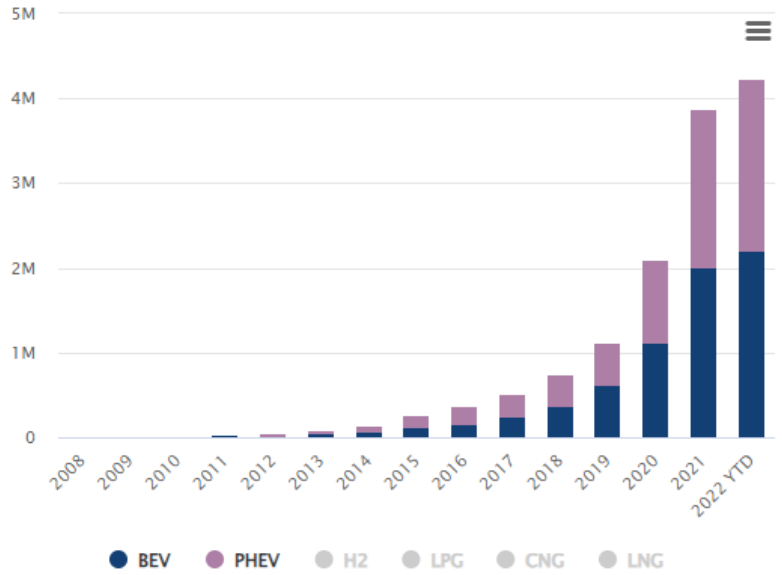
Installations needed to reach targets:

- **213** public re-charging points **per working day** in **2021**
- **550** public re-charging points **per working day** in **2025**

Adding to this the (fast) charging points needed for e-scooters, trucks, buses, etc…

A huge challenge!

Total Fleet of BEV & PHEV passenger cars in Europe (2022 YTD)



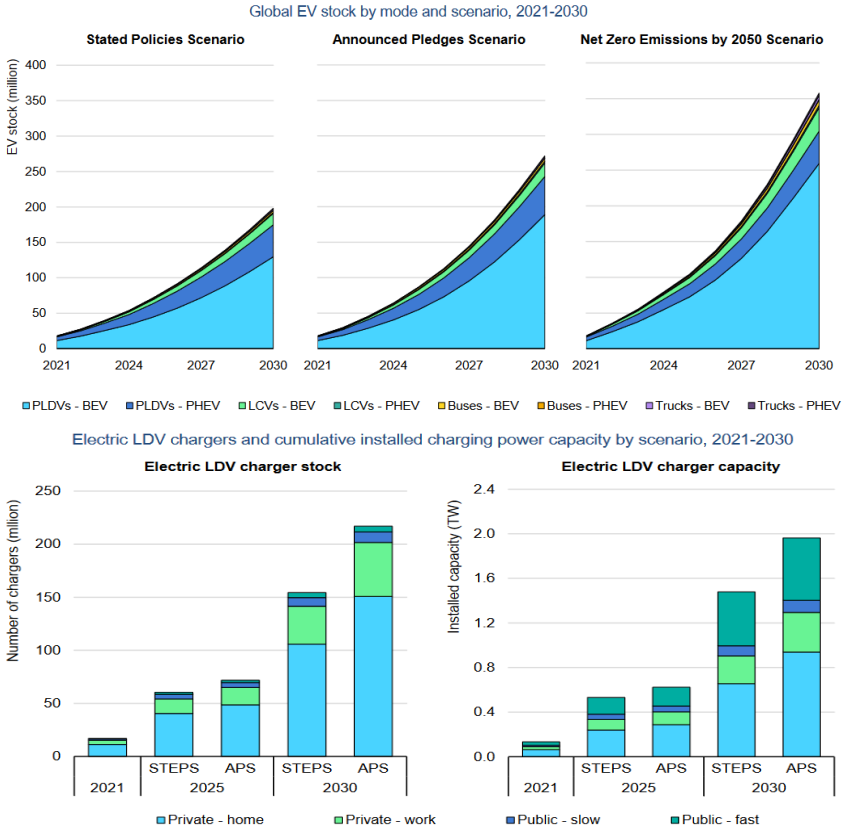
source: www.eafo.eu

Growing demand on 2022

To meet net zero emissions expected from the combustion engine production stop in 2050, infrastructure is way far to meet the requirements for Light Duty Vehicles (LDV).

The current public chargers account for less than 10% of the stock in 2030. It is expected that **fast charging** will reach a **25-30%** of the installed capacity due to the high power ratings.

More than 20 million charging points for electric LDVs need to be installed every year to 2030 to support the growth of electric cars projected in the announced pledges scenario.



source: IEA

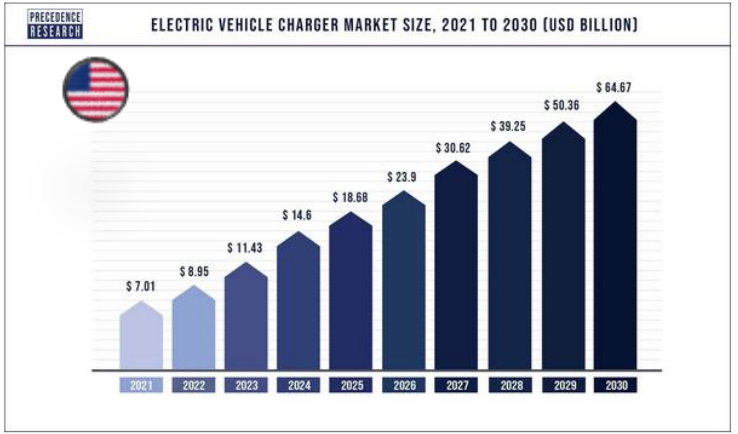
Demand of fast charging infrastructure

High power chargers are also a solution for minimizing the amount of charge points on the field.

During the past years, demand of powers above 50kW has increased and now it is common to see high-power chargers (HPC) on the field such as 350kW or +100kW multi-outlet.

A new private investment of +700M€ in Europe plans to install more than 7.000 350kW chargers by 2025.

Charger market size in USA was valued as 7.01 B$ and it is expected to grow until 64B$ by 2030.



Demand of efficient planning

The market continues to suffer with inertia with EV uptake hampered, partly, by insufficient infrastructure, and low levels of uptake restricting the revenue opportunity from charge point installation.

By gathering charging data, usage trends and location specific peculiarities; deep learning models can be used to create a cost-effective charging station deployment. This also helps to predict the future deployment and energy needs of the market.

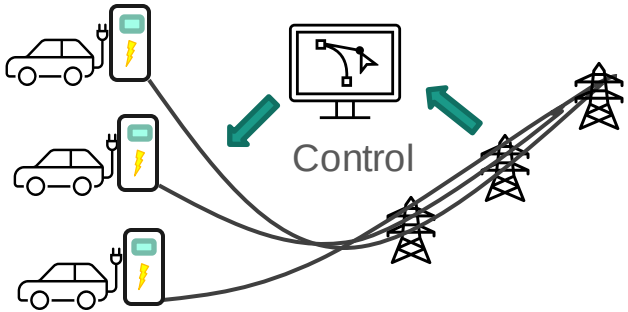
Minimizing the impact of lack of charge points with “smart” deployment

Smart Deployment Strategy → **Lower Infrastructure Investment**

Demand of efficient charing

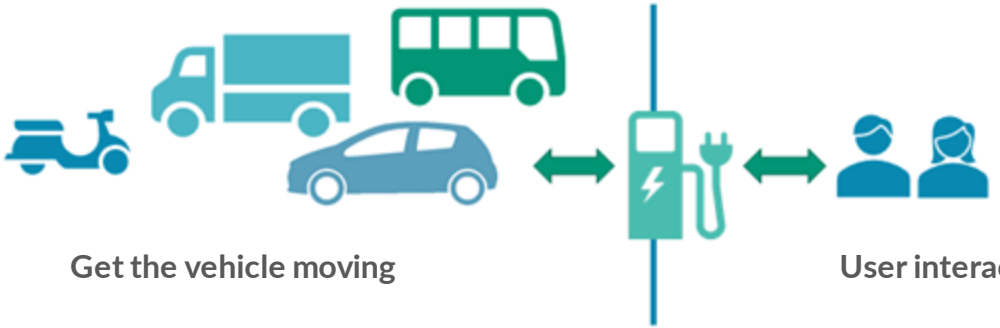
Electromobility will increase the electric demand, and this could affect our grids. To minimise this problem different strategies are being pushed by the industry and policy makers.

- **Smart Grid** : Infomation is power!
- **Dynamic charge** : better grid stability
- **Bi-directional charge** : improve peak power response
- **Economic incentives** : shape demand (win-win scenario)



Why is EV charging important?

Without recharging infrastructure
there is no sustainable mobility business case



Get the vehicle moving

User interaction and satisfaction

Sufficiently available	Reliable
Power (charging speed)	User friendly

Concerns of policy makers and authorities

Risks for policy makers and authorities:
- Lack of safety
- High operating costs
- Non scalable investments: sunk assets
- Vendor lock-in: tariff spikes, no access to data…

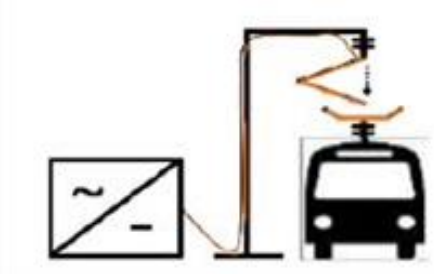
These risks must be controlled, to **prevent a closed of market** that could lead to **high procurement and operational costs and high recharging tariffs.**

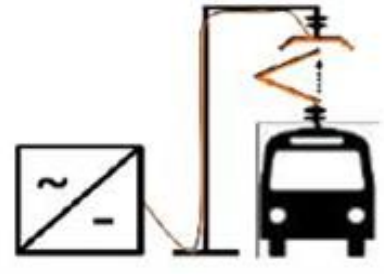
Policy makers should focus on creating an **interoperable** charging infrastructure market, based on **open standards** and that's **accessible** for new players.

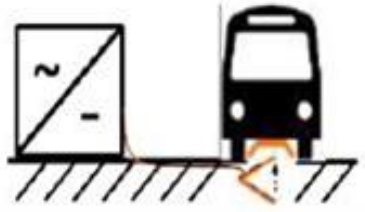
An introduction to the EV charging ecosystem

Different solutions for different vehicle types

	N. America	Japan	EU and the rest of markets	China	All Markets except EU
AC	J1772 (Type 1)	J1772 (Type 1)	Mennekes (Type 2)	GB/T	
DC	CCS1	CHAdeMO	CCS2	GB/T	Tesla







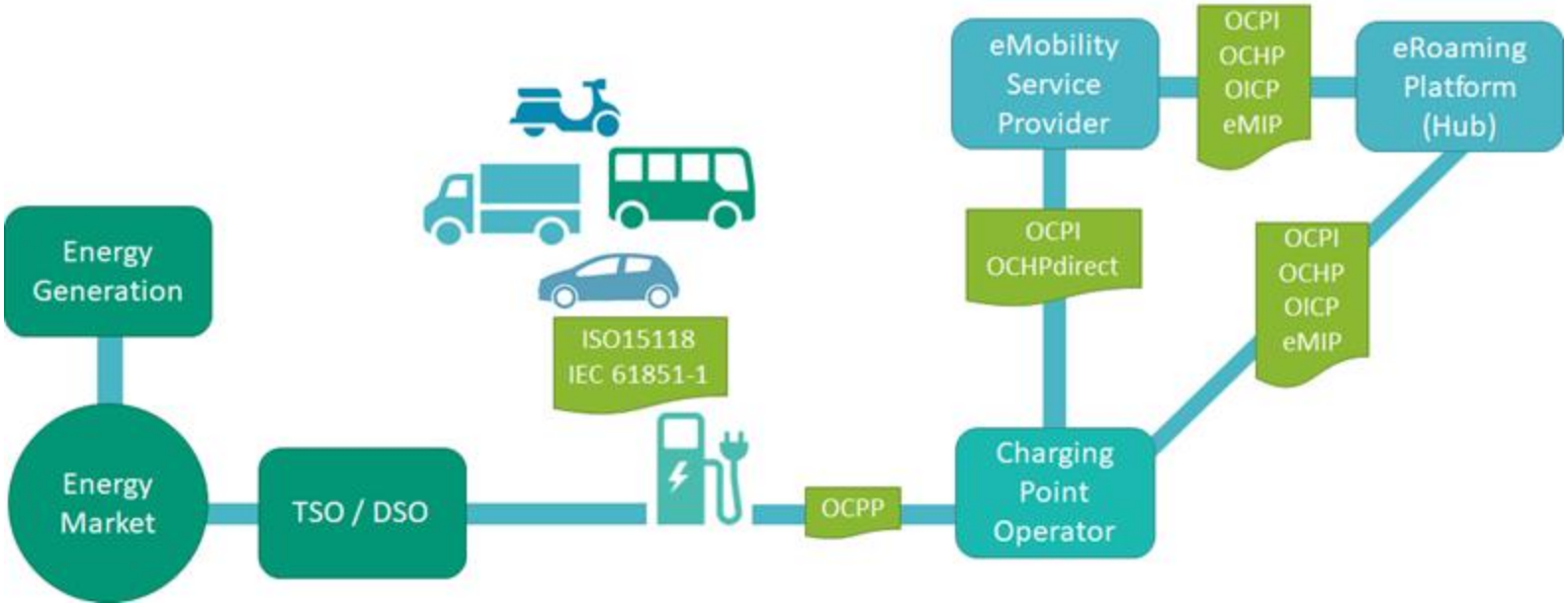
Alternative and future charging

- Fixed catenary - flash charging
- Static or dynamic inductive & conductive power transfer
- High power cable: GB/T and MCS (Megawatt Charging System)

Near-future standards	
DC fast charge	
ChaoJi	HPCVC
	
1500V x 600A 900 kW China, Japan	1500V x 2000A 3.000 kW N-America, Europe
Will replace CHAdeMO & GB/T Available 2020/2021 Higher power very important for Trucks/Buses	Proposal **Charin**, supported by many OEM's. Higher power very important for Trucks/Buses

(Open) standards and interoperability and why are these important?

EV Charging Market: Many protocols



Important open standard protocols

- Vehicle to Chargepoint
- Chargepoint to Operator
- Operator to eMSP / Hub / Clearing house

What is interoperability in the EV ecosystem?

*Interoperability is the **ability** of vehicles, chargers, networks and management systems **to interact and manage data**, to ensure:*

- Safety
- Compatibility of equipment and protocols
- Functionality
- System reliability
- Availability

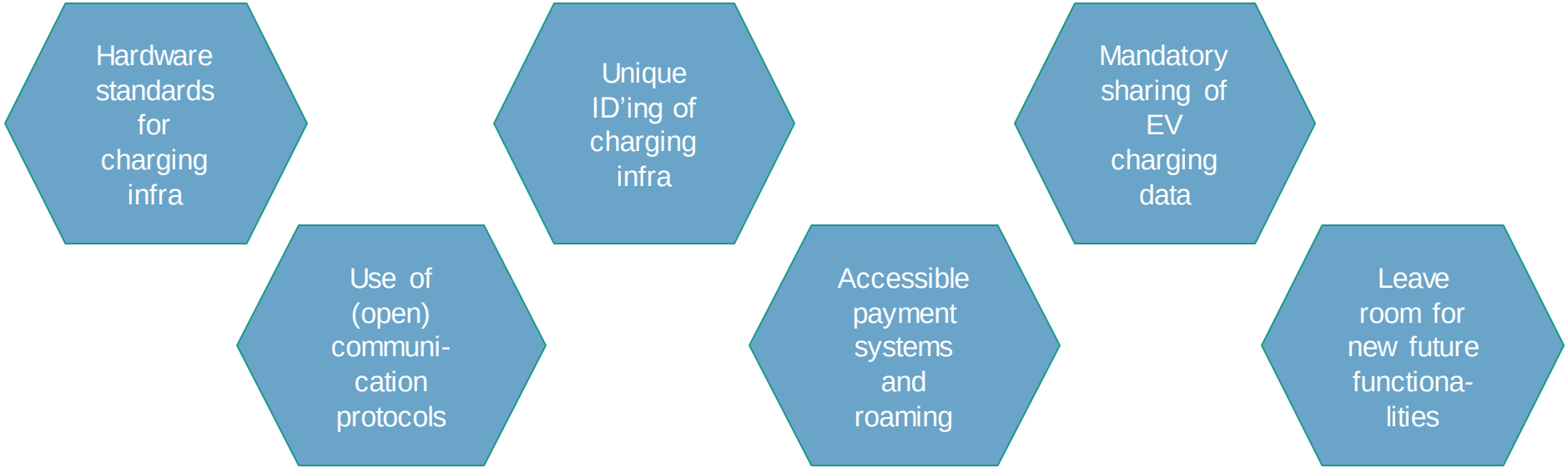
Why is interoperability important for EV charging?

"With the rise of the e-mobility ecosystem, millions of charging stations are to be installed within the next couple of years. This means interoperability is key to maximise investment returns in the industry and user satisfaction."

Interoperability and compatibility testing

From refueling to recharging, the complexity has increased. Recharging product validation becomes a MUST

Recommendations for regulations



Regulations will speed up the process of adopting common standards and will improve the successful uptake of EV

Lessons learned in Europe

Example 1:

Lock-in: Proprietary charging systems on certain E-buses not compatible with EU standards

Example 2:

Type-2 (EU standard)

vs.

Type-3 (France and Italy)

Thank you for your attention