

Session 2

A cross-case analysis of six, real-time Smart Charging and V2X Operational Pilots in the North Sea Region

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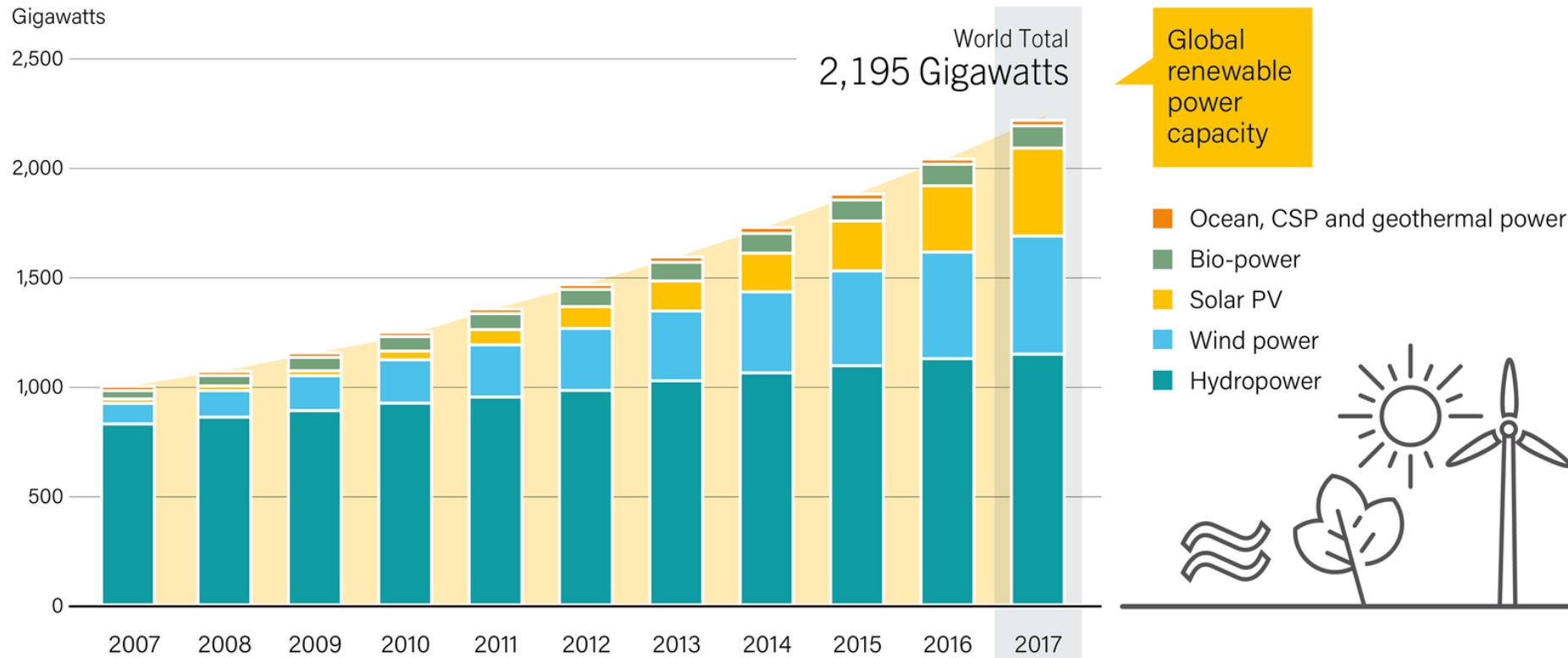


Why Vehicle for Energy Services (V4ES)?



Renewable energy growing fast

FIGURE 5. Global Renewable Power Capacity, 2007-2017



Renewable energy growing fast



Environment

Germany set to pay customers for electricity usage as renewable energy generation creates huge power surplus

Output from wind turbines forecast to hit record on Sunday

Jesper Starn | Friday 27 October 2017 09:29 |

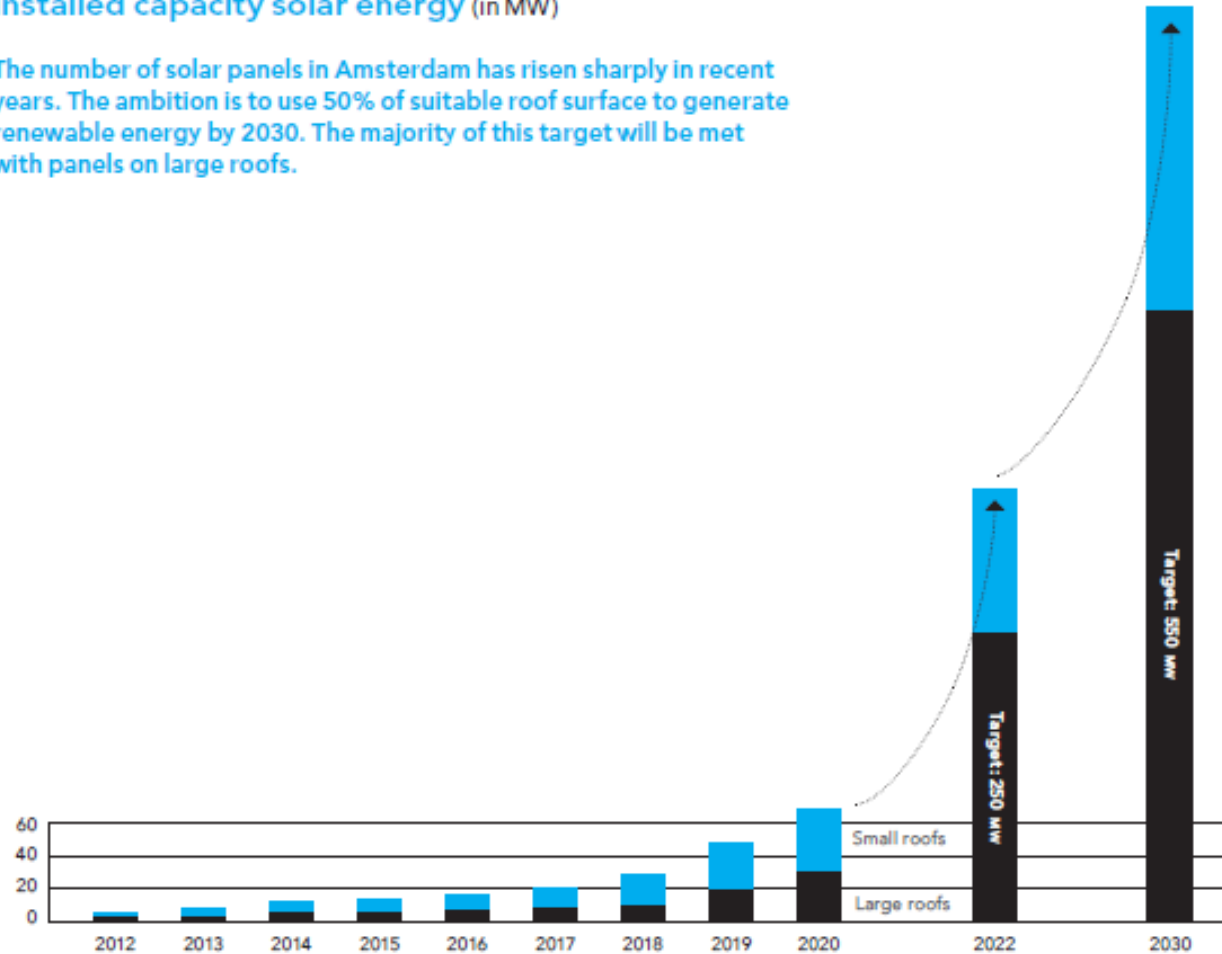
Source: Jaap Burger/ Art van der Giesen – Webinar: [Amsterdam – Roadmap Towards a Climate Neutrality City and the Importance of Smart Grid Solutions](#)



Renewable energy growing fast

Installed capacity solar energy (in MW)

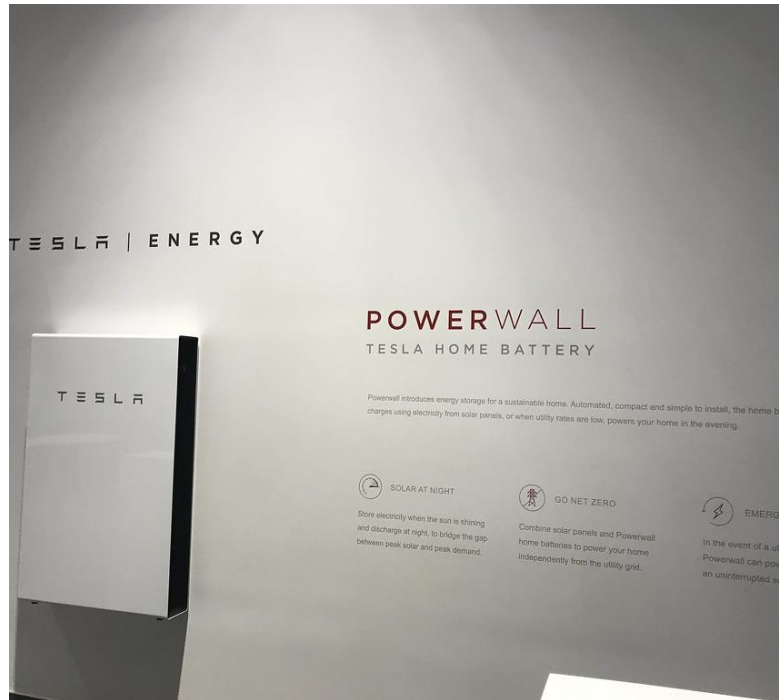
The number of solar panels in Amsterdam has risen sharply in recent years. The ambition is to use 50% of suitable roof surface to generate renewable energy by 2030. The majority of this target will be met with panels on large roofs.



Source: Jaap Burger/ Art van der Giesen – Webinar: [Amsterdam – Roadmap Towards a Climate Neutrality City and the Importance of Smart Grid Solutions](#)



Storage systems as buffer



Storage systems as buffer



Transition

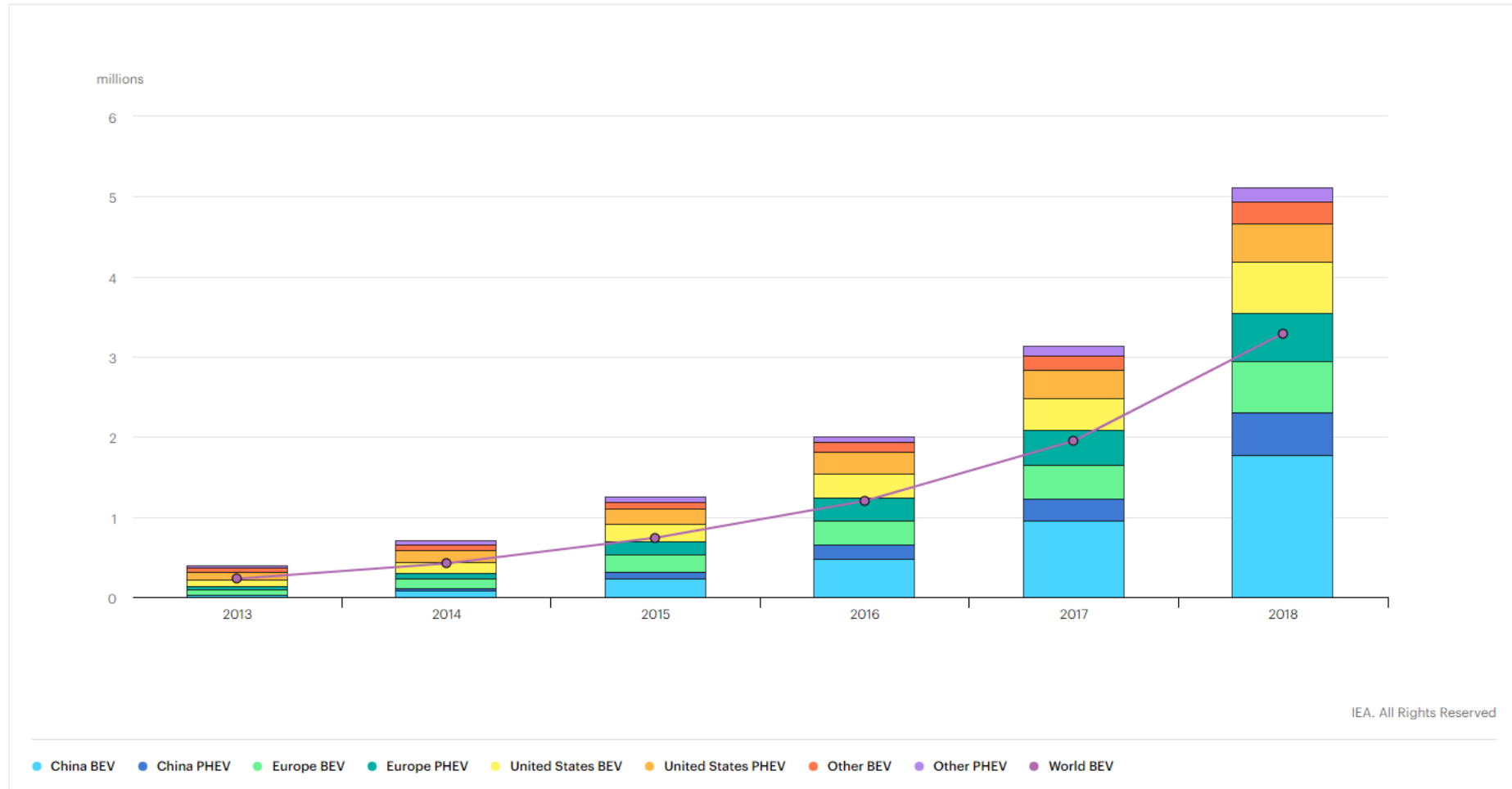
1900 New York 5th avenue



1913 New York 5th avenue

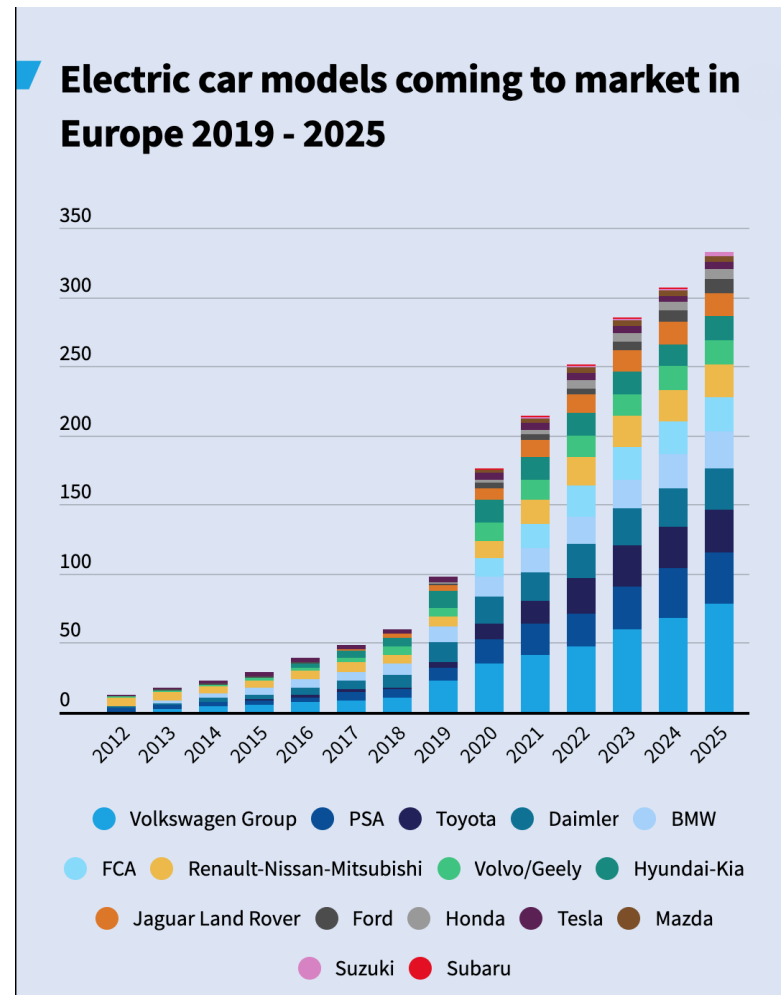


Electric mobility is growing fast



Source: IEA, Electric car deployment in selected countries, 2013-2018, IEA, Paris <https://www.iea.org/data-and-statistics/charts/electric-car-deployment-in-selected-countries-2013-2018>

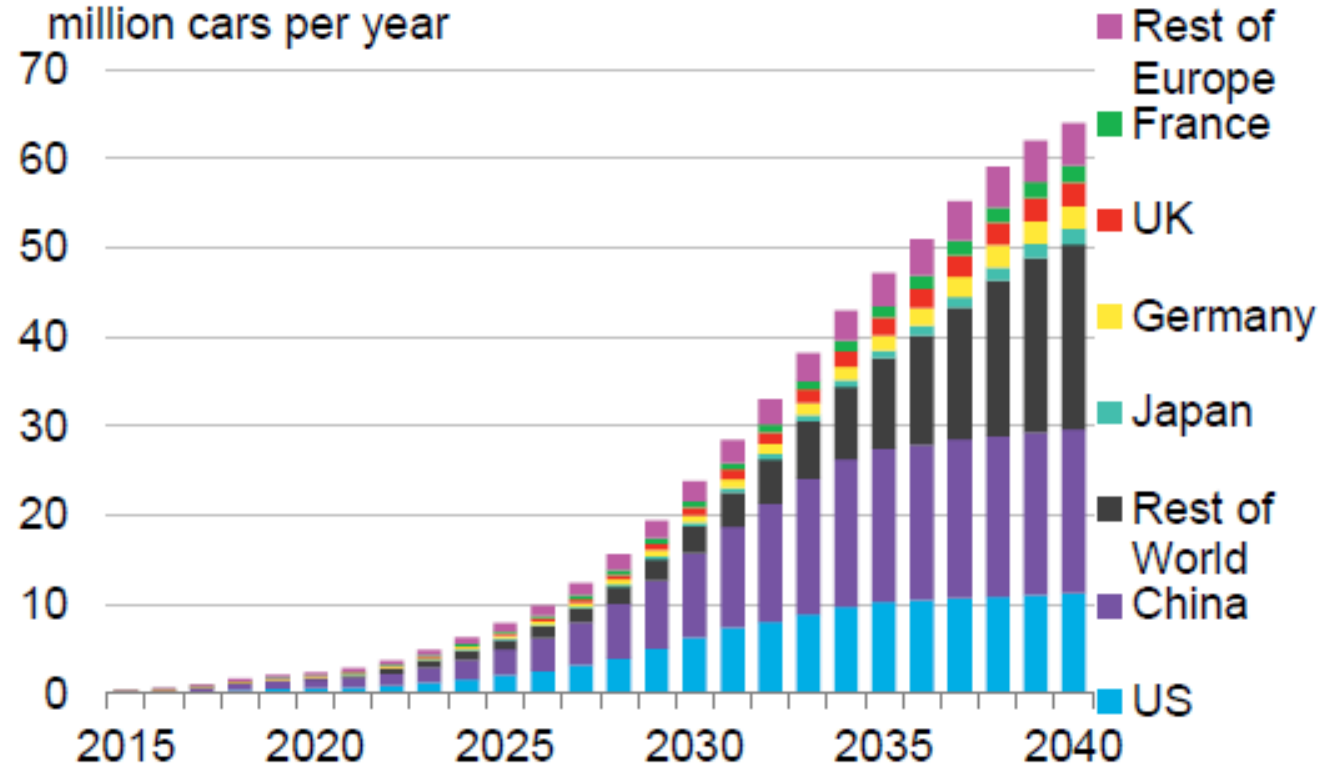
Electric mobility is growing fast



Source: Transport & Environment



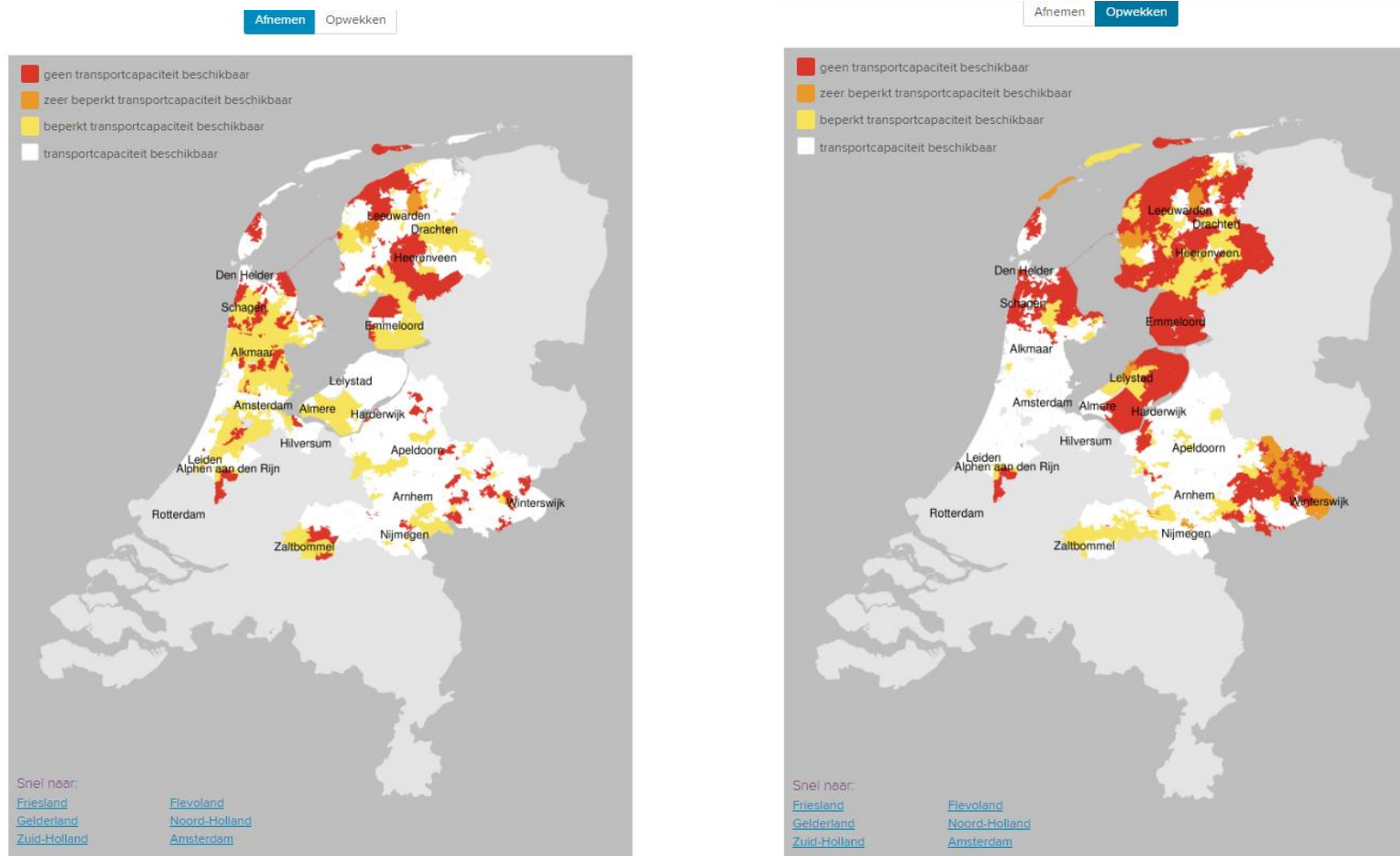
Electric mobility is growing fast



Source: EV outlook 2018



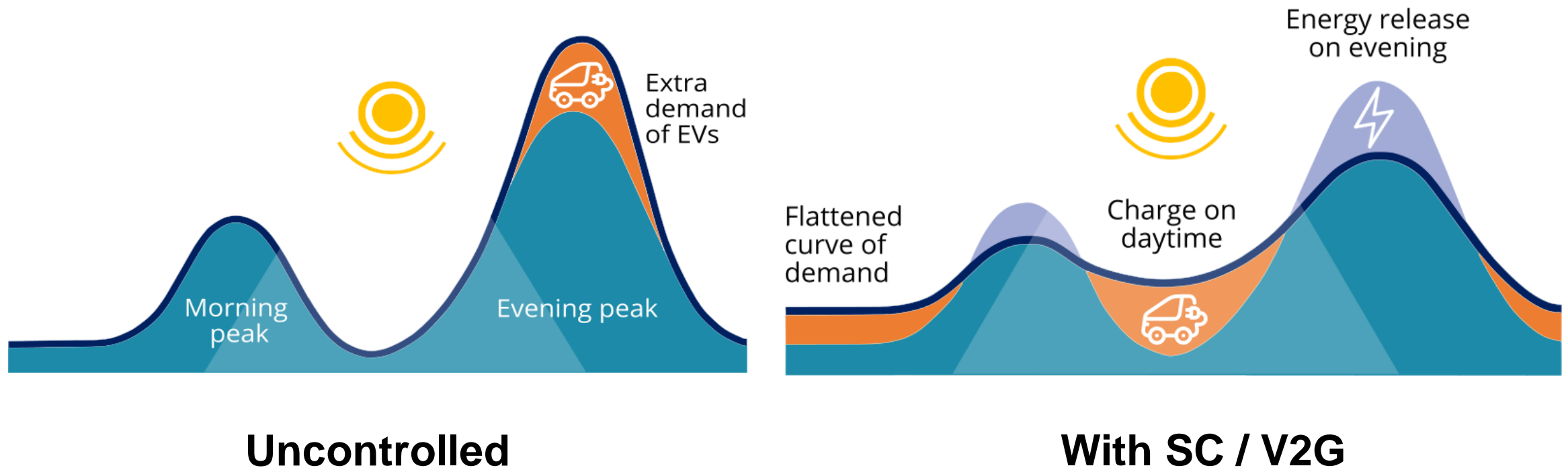
Network congestion



Source: <https://www.liander.nl/transportschaarste/beschikbaarheid-capaciteit>

Vehicle To Infrastructure (V2X):

Utilizing battery electric vehicles for energy services (V4ES)





6
Pilots

Sep 2016
–
May 2020

5 mln
budget

11
partners



northumbria
UNIVERSITY NEWCASTLE

POLIS
CITIES AND REGIONS FOR TRANSPORT INNOVATION


cenex



Amsterdam University
of Applied Sciences

KU LEUVEN


cenex
nederland

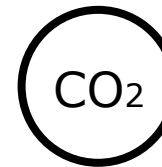
AVERE

JOHAN CRUIJFF
ARENA

City of
Amsterdam



Key Performance Indicators



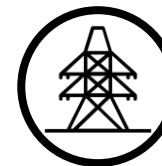
Reduce CO₂ emissions

Project objective: 130 – 210 tons yearly



Increase energy autonomy

Project objective: increase varies up to 30



Avoided grid investments

Project objective: calculation by extrapolation of
OP results





Loughborough - phase 1 (UK)

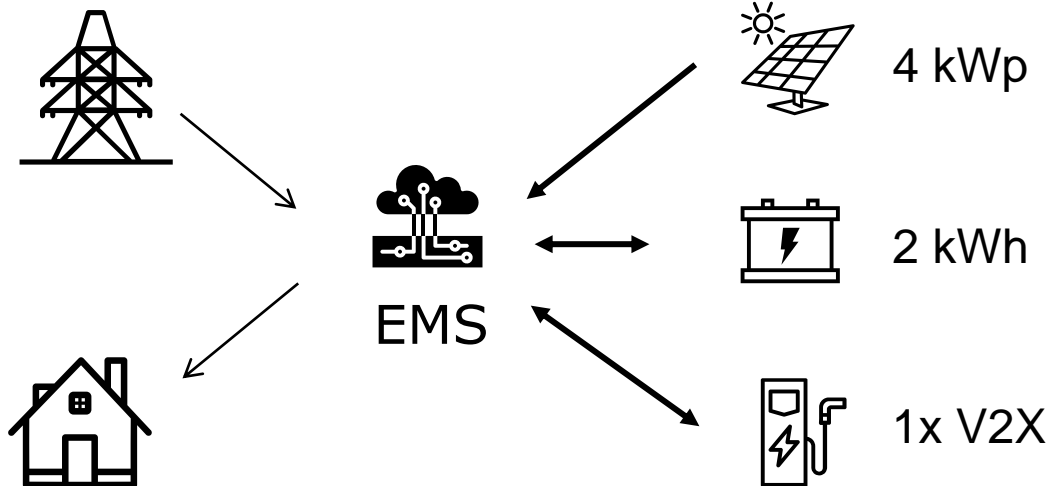
Cenex employee home owner



Pilot characteristics

- A single household
- Vehicle used was a 24 kWh Nissan Leaf
- Equipment inherited from the EFES project
- New installation in Burton-upon-Trent

(2015)



Key findings



Behind the meter



Commissioning



Almost 1 year

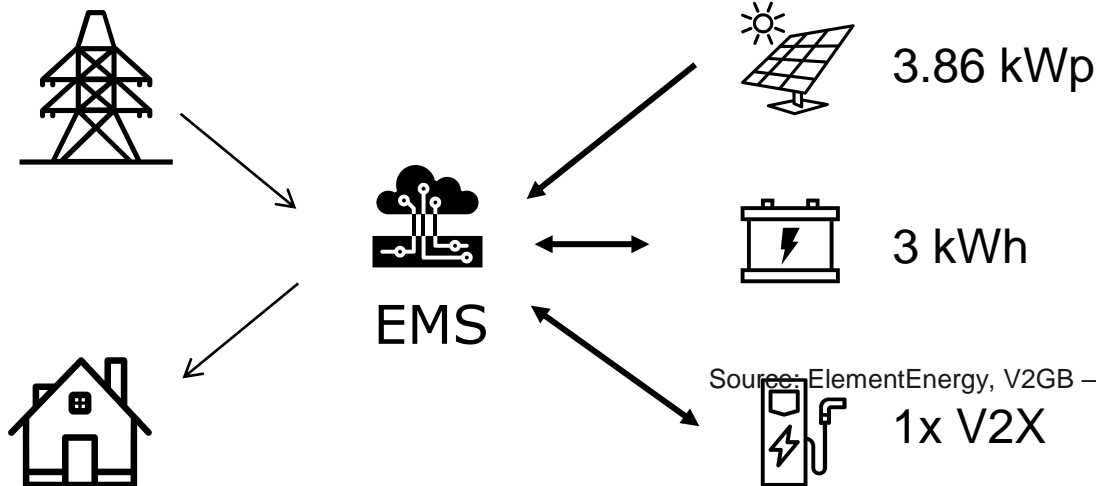
Burton upon Trent - phase 2 (UK)

Cenex employee home owner



Pilot characteristics

- OVO bi-directional charger from Sciurus V2G project (1000 V2G units installation), now operating true V2G
- BSS can now charge/discharge at variable rate
- Grid rules have been updated in favour of V2G operations



Key findings

Aggregated

Limited export

Low export value

Burton upon Trent - phase 2 (UK)

Cenex

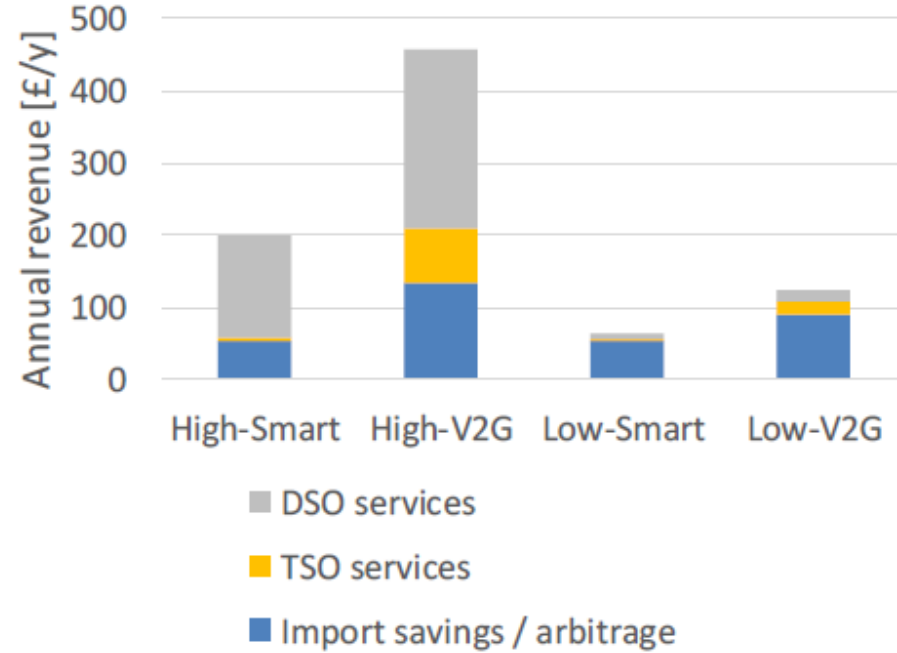
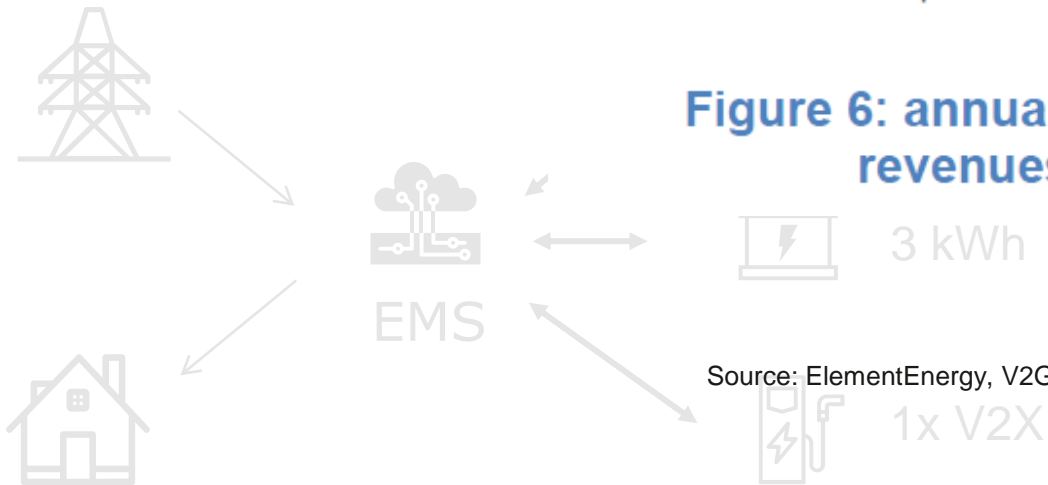


Figure 6: annual Smart and V2G revenues in 2030



Source: ElementEnergy, V2GB – Vehicle to Grid Britain



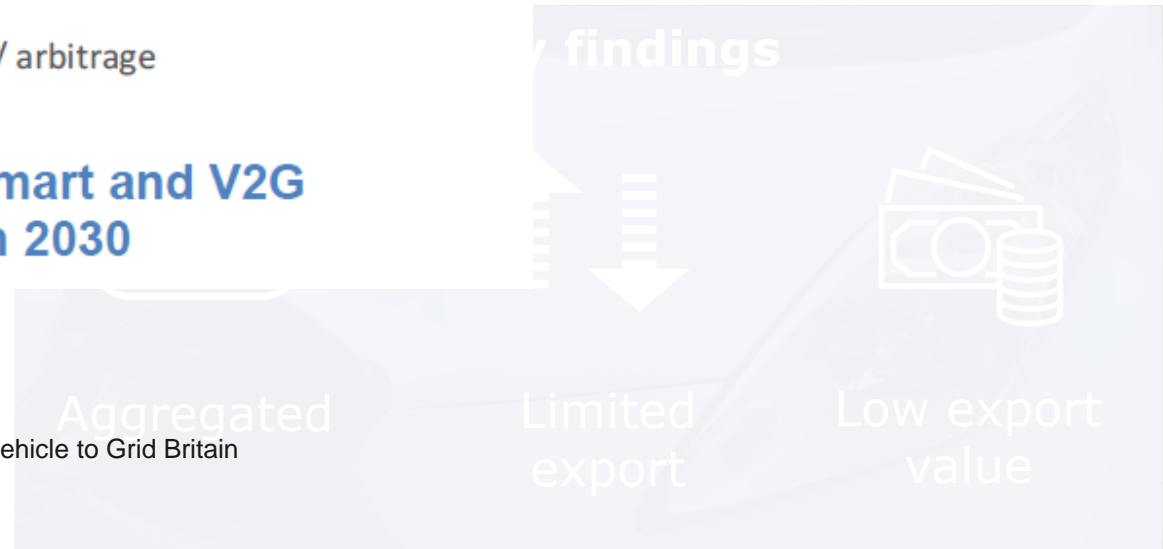
Characteristics

larger from Sciurus V2G project (initially a V2G simulation, now operating true V2G)

discharge at variable rate

updated in favour of V2G

Key findings





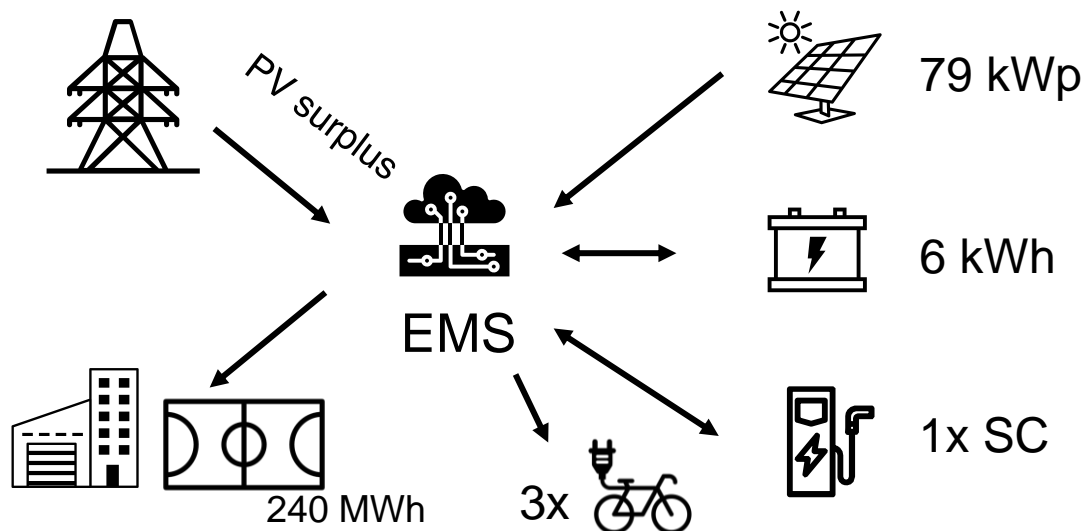
Kortrijk (BE)

The City Depot of Kortrijk



Pilot characteristics

- One Nissan E-NV200 that follows the same delivery route every day
- Self developed, python based EMS system to integrate all hardware by KU Leuven
- Epexspot (power exchange) for using flexible energy tariffs



Key findings



Very few suppliers for small batteries



Flexible tariffs



Temporary installation

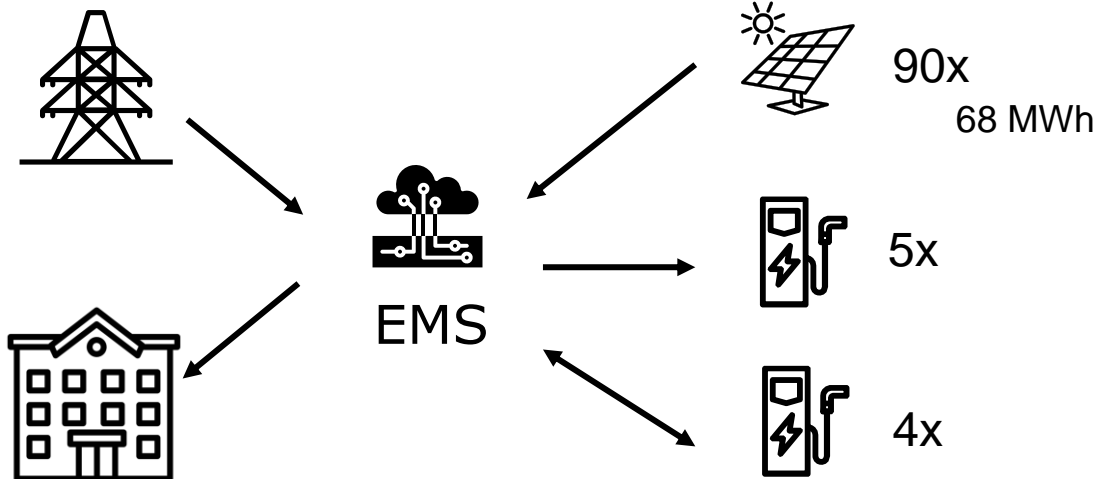
Leicester (UK)

Leicester City Hall

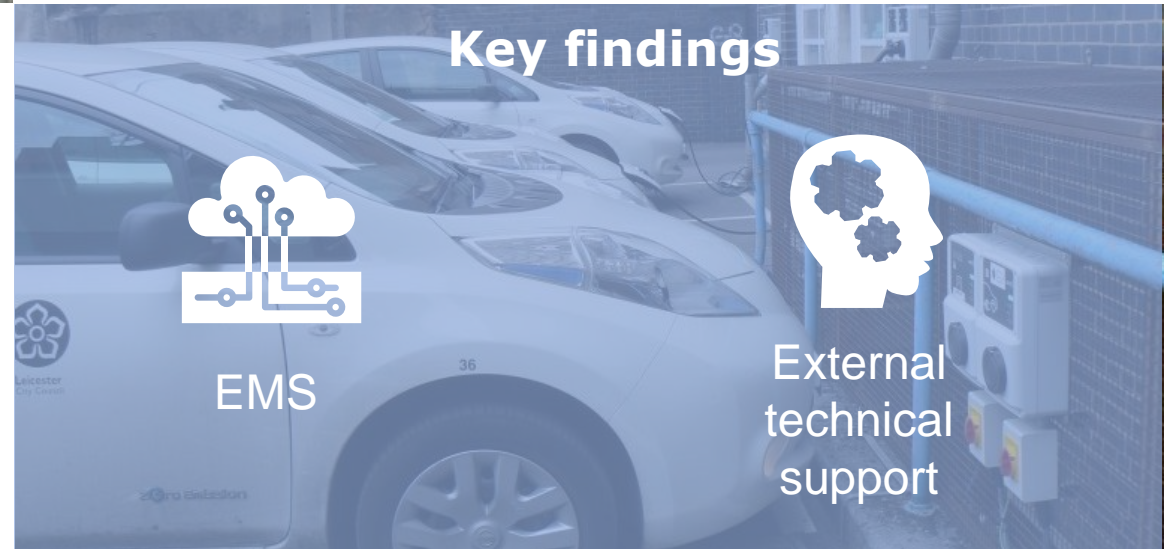


Pilot characteristics

- Two relocations
- Internal human resource constraints
- In the process of procuring four V2X chargers



Key findings





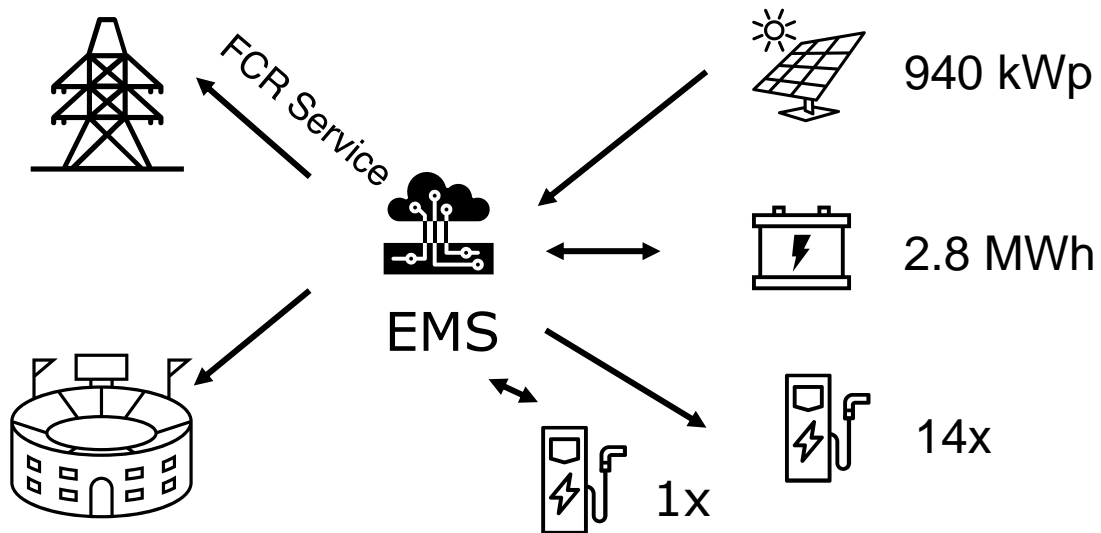
Amsterdam (NL)

Johan Cruyff Arena



Pilot characteristics

- 140 Nissan Leaf Battery packs
- Frequency Containment Reserve (FCR) outside event days
- Recently installed 14 fast charging units and 1 V2X unit



Key findings



9 years
RoI



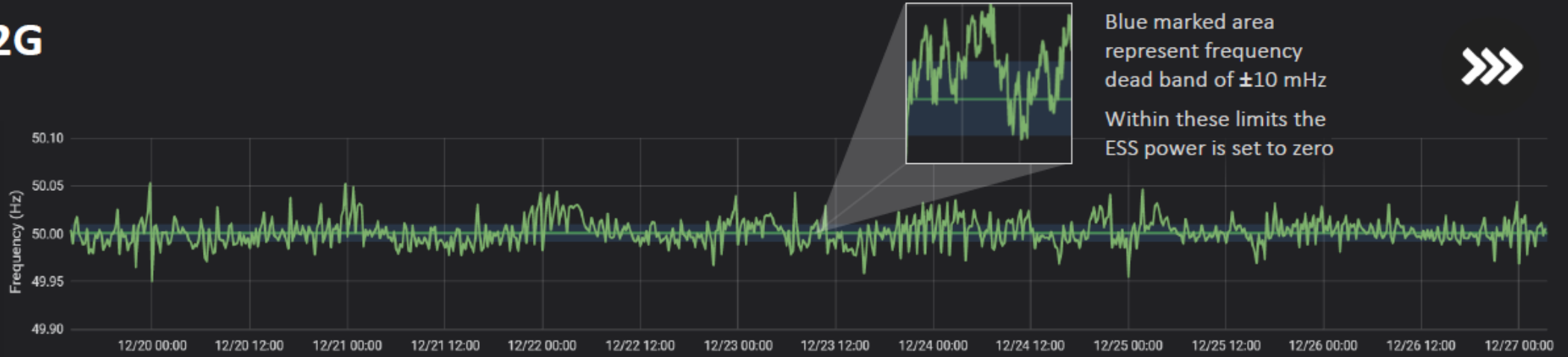
New and old
batteries



Free during
events when
V2X

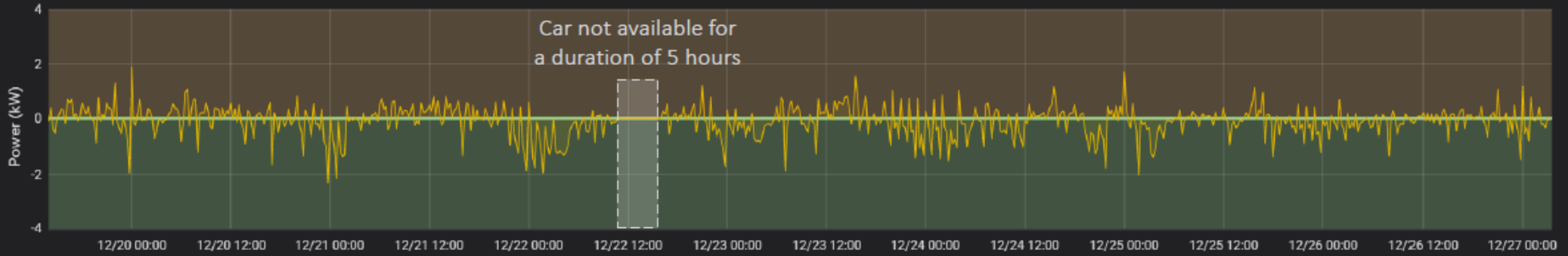
1 Week of V2G

Frequency



Power

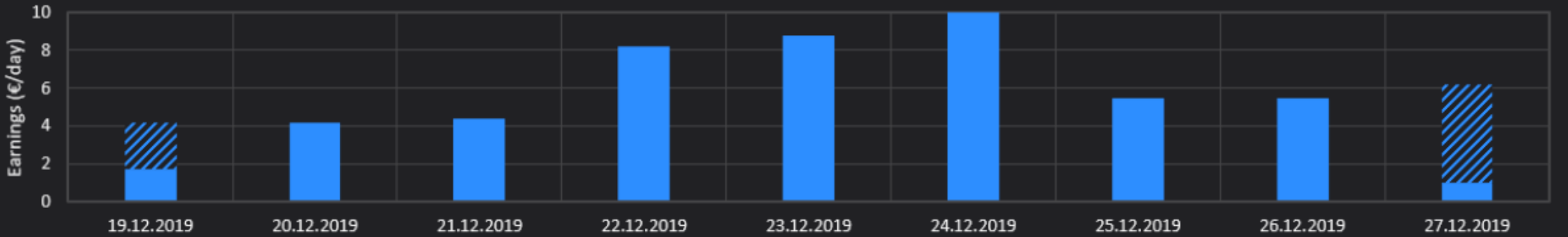
Charging = Green
Discharging = Orange



Earnings

as achievable between
19 Dec, 14:00 and
27 Dec, 03:30

≈ 50€ in total





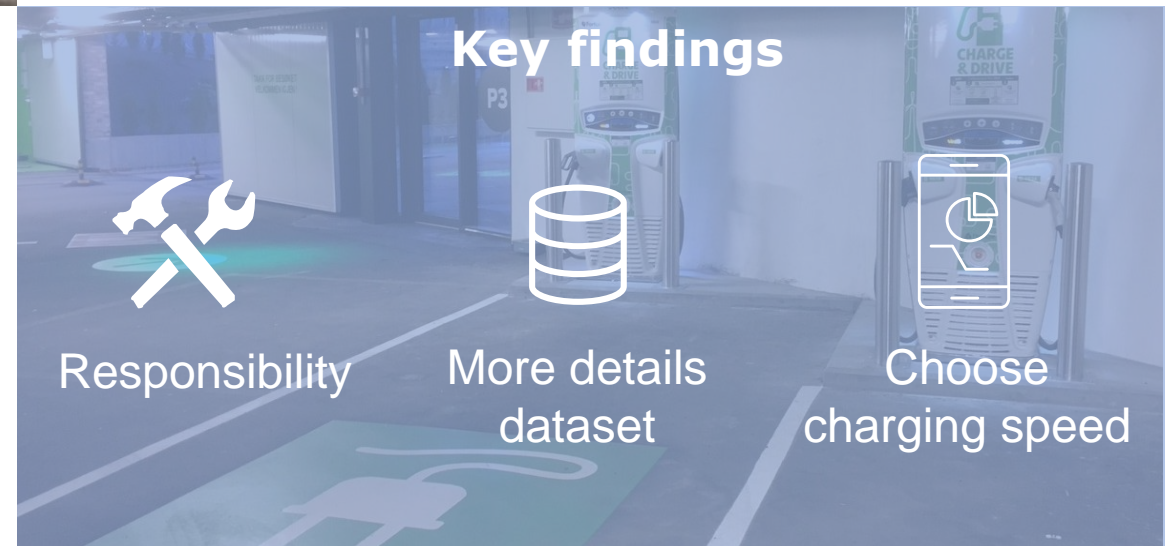
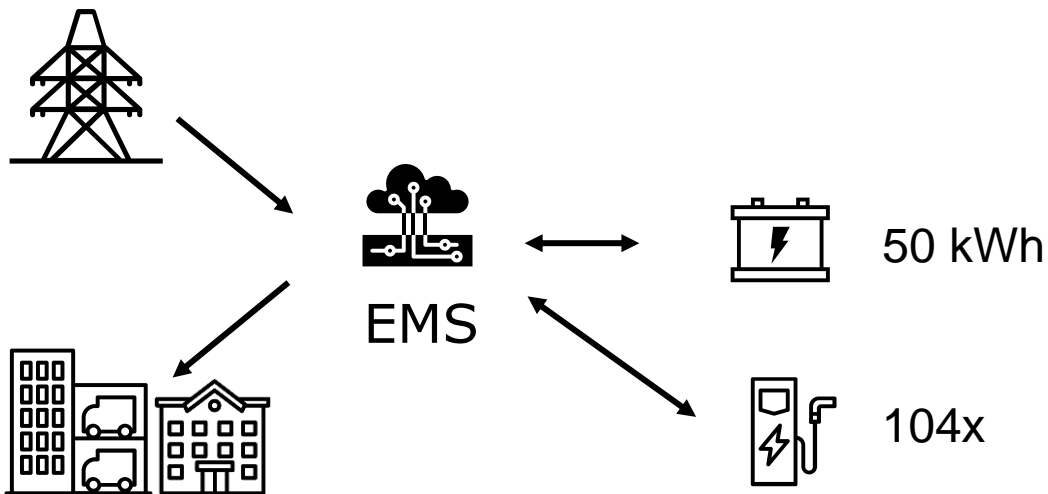
Oslo (NO)

Vulkan Real Estate



Pilot characteristics

- 50 units with 100 connectors (up to 22 kW), AC V2G ready
- 2x DC fast charging units (50 kW) with ChaDeMo and CCS
- Battery used for peak shaving, inverter capable of phase balancing





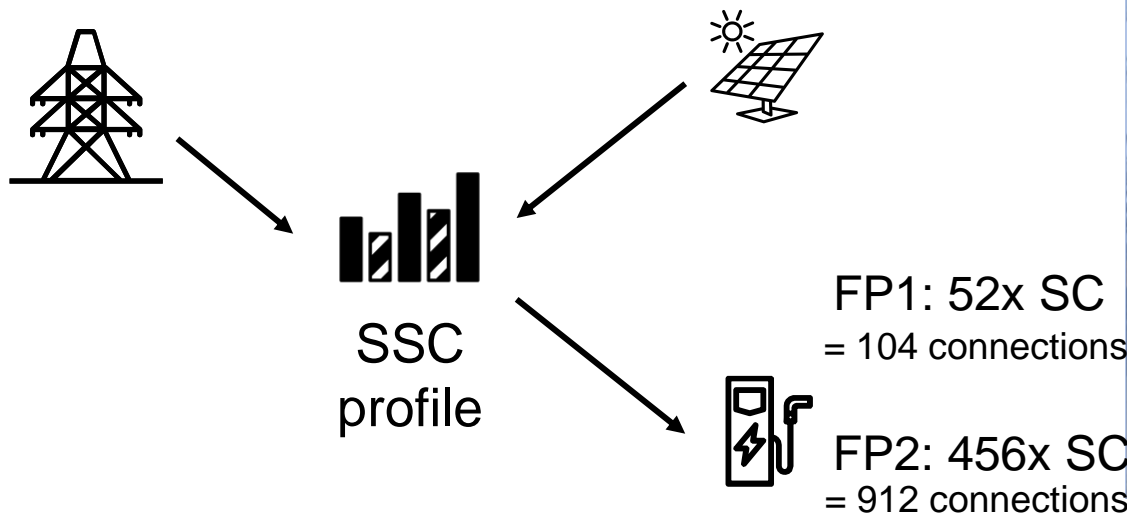
○ Amsterdam (NL)

Flexpower Amsterdam



Pilot characteristics

- FP1: Six Static Smart Charging (SSC) profiles
- FP2: 24h grid capacity forecast communicated by DNO, translated to the OCPP and send to CPs
- Open standards used: OCPP and OSCP
- Faster charging outside peak demand times



Key findings

Amsterdam elektrisch

Flexpower

Data security in place

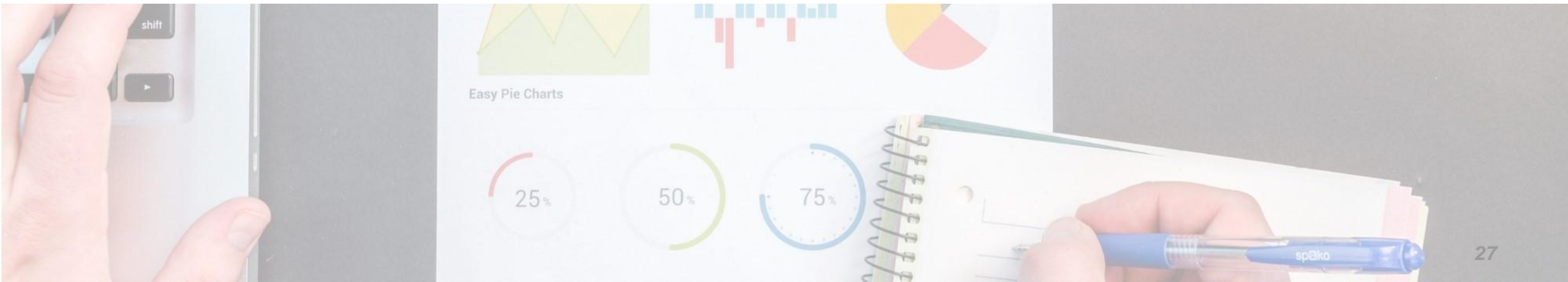
Higher connection costs SC

Charge Capacity limitations

Lessons Learnt

from six operational pilots
with different scales

- ① **Technology: the V2X market is not fully mature**
- ② **Configuration: tailor-made projects**
- ③ **Procurement: knowing the market is key**
- ④ **Business models: V2X requires customised BM**



1

Technology: the V2X market is not fully mature



Technology in development

Procurement and installation may change



OEM warranties

Manufacturers are reserved on providing warranties



Car compatibility

Not all EVs support bi-directional charging



Expensive

V2X units are currently very expensive

Source: ElementEnergy, V2GB – Vehicle to Grid Britain



Technology



Technology in development

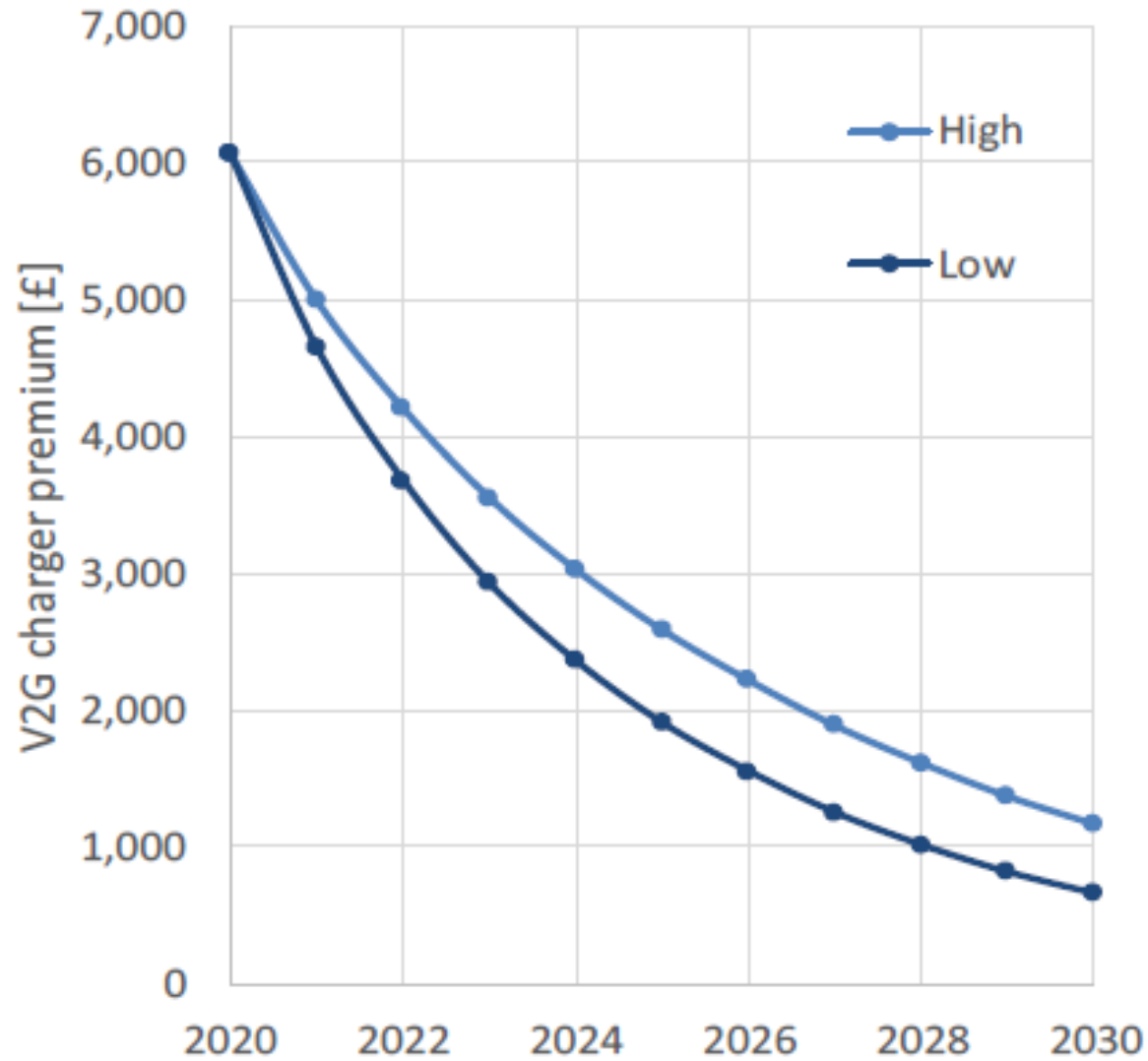
Procurement and installation may change

Fully mature



Expensive

V2X units are currently very expensive

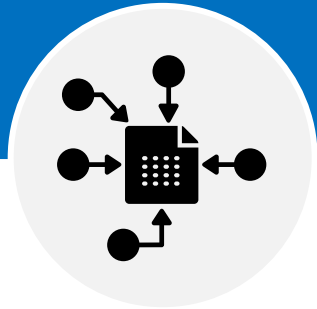


Source: ElementEnergy, V2GB – Vehicle to Grid Britain



2

Configuration: tailor-made projects



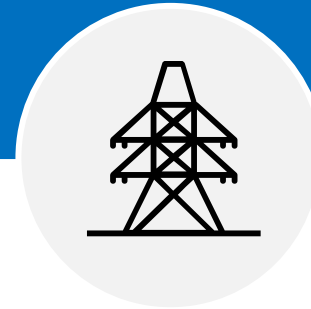
Merge different data collection systems

Pre-existing installations such as PV



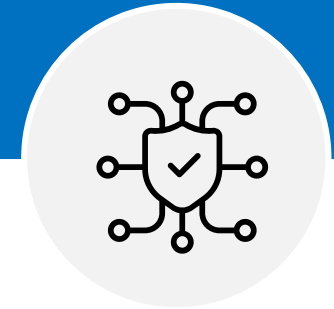
Technical issues

Communication and compatibility



DNO requirements

Installation and operation behind the meter



Data security and privacy

Be mindful with the access to collected data



3

Procurement: knowing the market is key



Total system suppliers

Consortia for installation and operation



Procurement time planning

Components may have long lead-times



Investment in human capital

Invest in knowledge training



Know what suppliers offer

Product specifications and terms of supplier



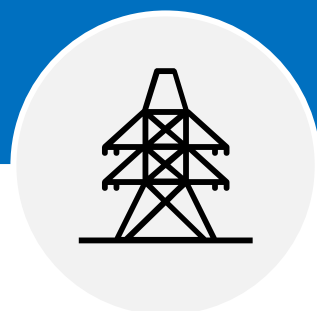
4

Business models: V2X requires customised BM



Tariffs and type of consumer

Different regions and project purposes



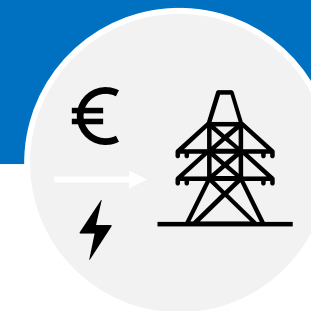
Avoided grid investments

Location and network specific



Smart charging currently a better business case

Less expensive units and wider applicability



V2G may become more rewarding

If Feed-in-Tariffs are altered in the future



Key takeaways

PRIORITIES

price and the availability of bi-directional charging units are key barriers

PROCUREMENT

compatibility of the technology in general is poor

PERSPECTIVE

Smart Charging currently favourable, but V2X still holds potential

Session 2

Questions?

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Interreg



North Sea Region

SEEV4-City

European Regional Development Fund

Thank you for your attention

Team Cenex

Webinar 10.06.2020



#SEEV4City

SEEV4City.EU



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