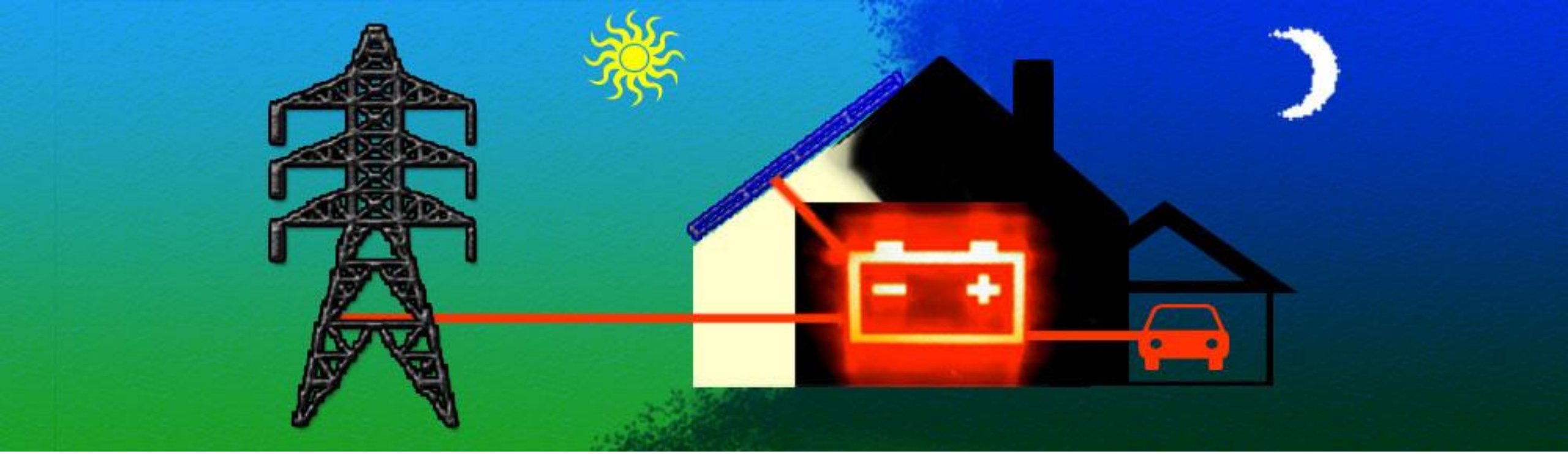


V2G EVSE Limited

UK “Domestic” V2G and DSR Trial Projects

National & International Standards

March 8th 2022

The UK's "EV Revolution"

Boris Johnson's keynote speech at the CBI on November 22nd 2021

"We will require new homes and buildings to have EV charging points – with another 145,000 charging points to be installed thanks to these regulations"

Assorted Anglian Acronyms

BEIS = Dept. for Business, Energy & Industrial Strategy

BSI = British Standards Institution

CBI = Confederation of British Industry

DNO = Distribution Network Operator (DSO)

DSR = Demand Side Response (DR)

DSRSP = DSR Service Provider (FO)

ESA = Energy Smart Appliance (CS)

ESAG = Energy Smart Appliance Gateway (RM)

FRED - Flexibly Responsive Energy Demand

NGESO = National Grid Electricity System Operator (TSO)

OZEV – Office for Zero Emission Vehicles

PAS - Publicly Available Specification

UK Vehicle-to-Grid Innovation

• The UK Government's Department for Business, Energy & Industrial Strategy has historically taken the view that early innovation shouldn't be hindered by regulation, or indeed "standards"!

• In 2018 they invested £30 million in a range of V2G feasibility studies, R&D projects and "real world demonstrators", with some additional R&D funding since then.

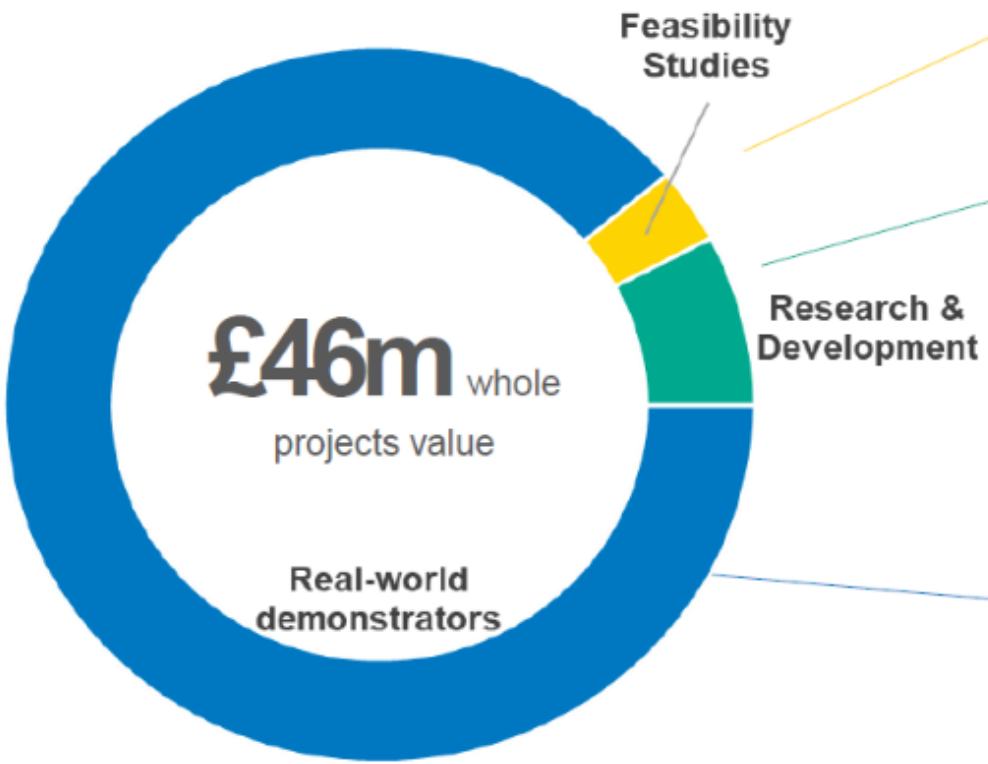
• BEIS has also invested in "Domestic DSR" R&D, including "smart charging".

• Perhaps unsurprisingly the "real world" projects that have resulted are largely based around proprietary standards. To the best of my knowledge even OCPP has not been utilised. That is certainly the case in the "domestic" projects to be discussed later.

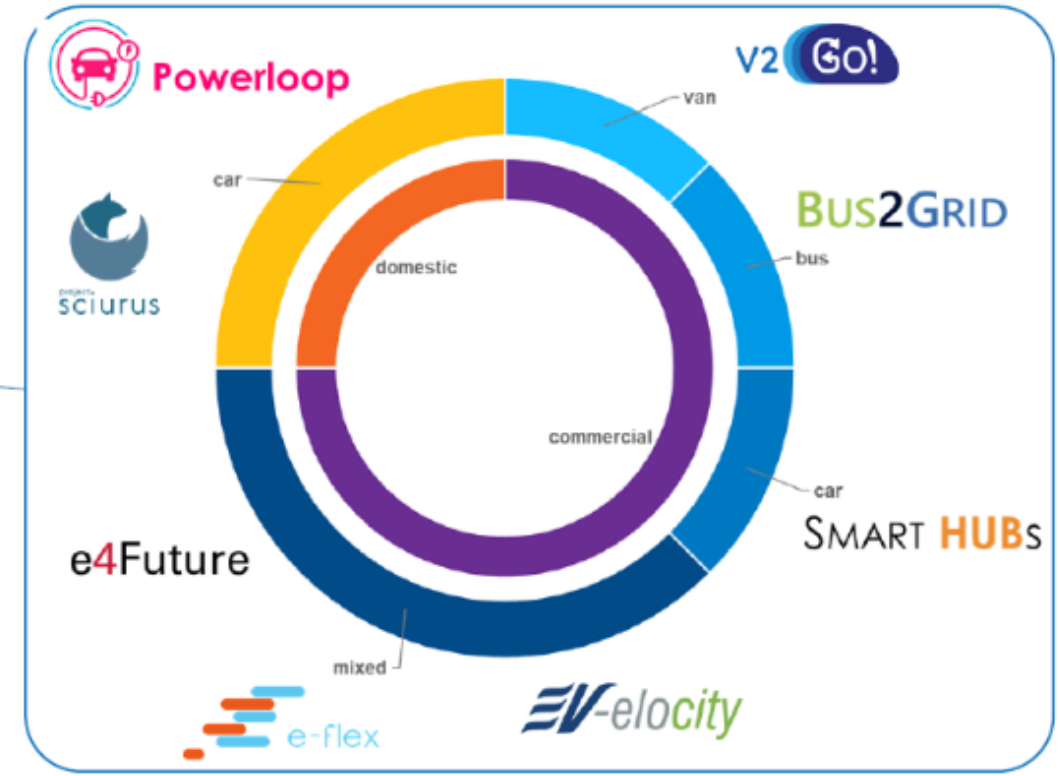
• However in 2021 the British Standards Institution published two "specifications" which treat an EV charging in a domestic environment as a special case of a so called "Energy Smart Appliance" .

The UK V2G programme

£30m funding from UK Government (BEIS and OZEV)



- **8 Feasibility Studies:** feasibility of innovative business models and applications for V2G
- **4 R&D Projects:** onboard charger development, V2G in on-street applications, gamification for V2G



Department for Business, Energy & Industrial Strategy

Office for Zero Emission Vehicles

BSI PAS 1878/89

Based on CENELEC - EN 50491-12-1

PAS 1878 is a “Publicly Available Specification – A work in progress towards a formal standard.

“*It defines good practice for a product, service or process. It’s a powerful way to establish the integrity of an innovation or approach.*”

Figure 3 – Representation of system level CEM–ESA energy flexibility architecture with separate CEM/ESAG

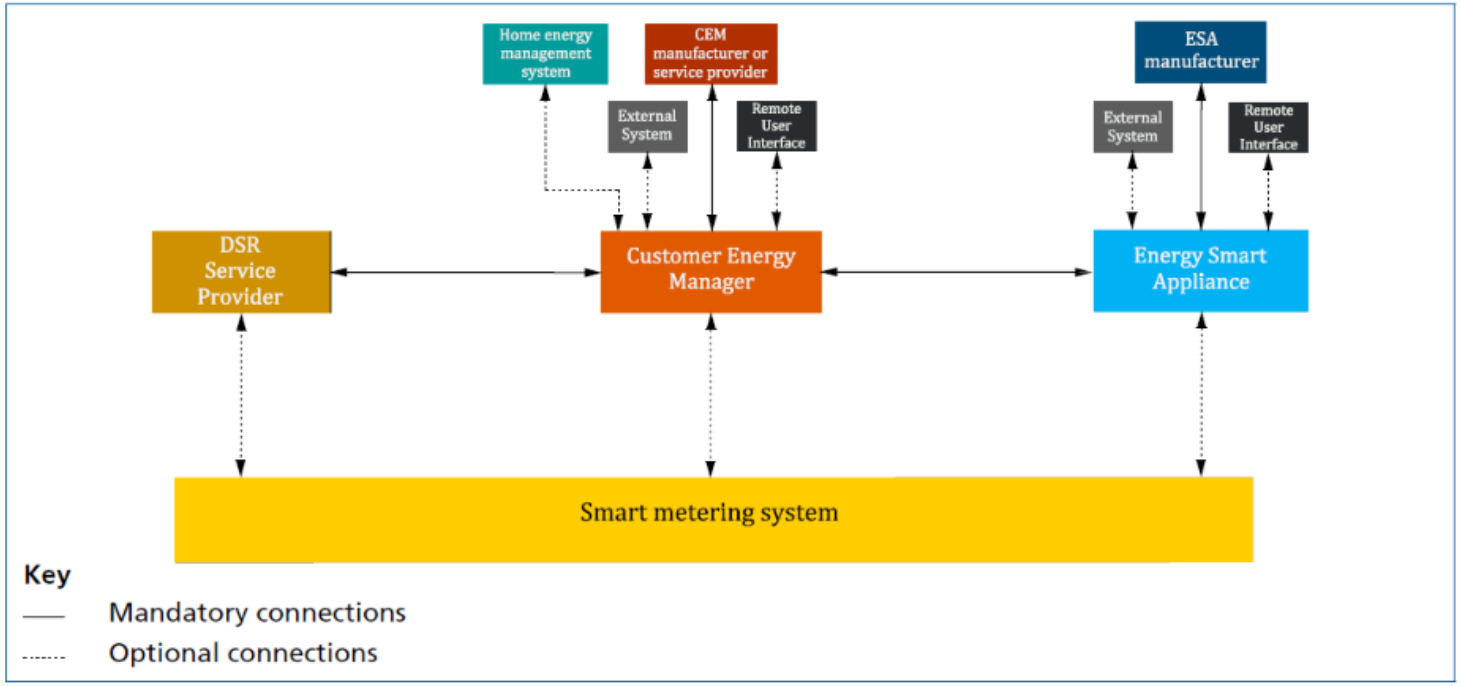
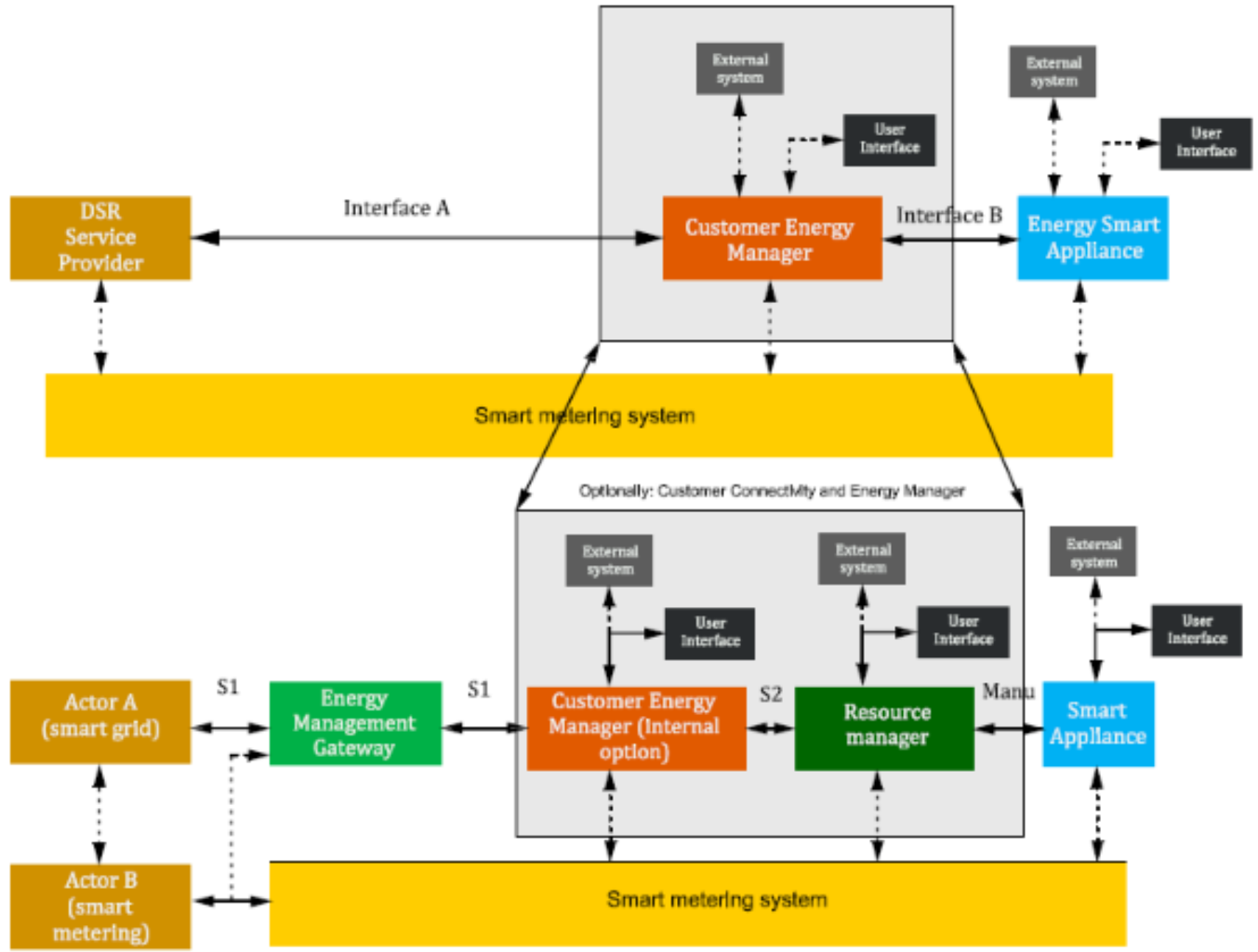


Figure E.1 – Mapping of PAS 1878 and CENELEC/IEC functional architectures

PAS 1878 architecture



CENELEC and IEC functional architecture representation

Octopus Energy Powerloop

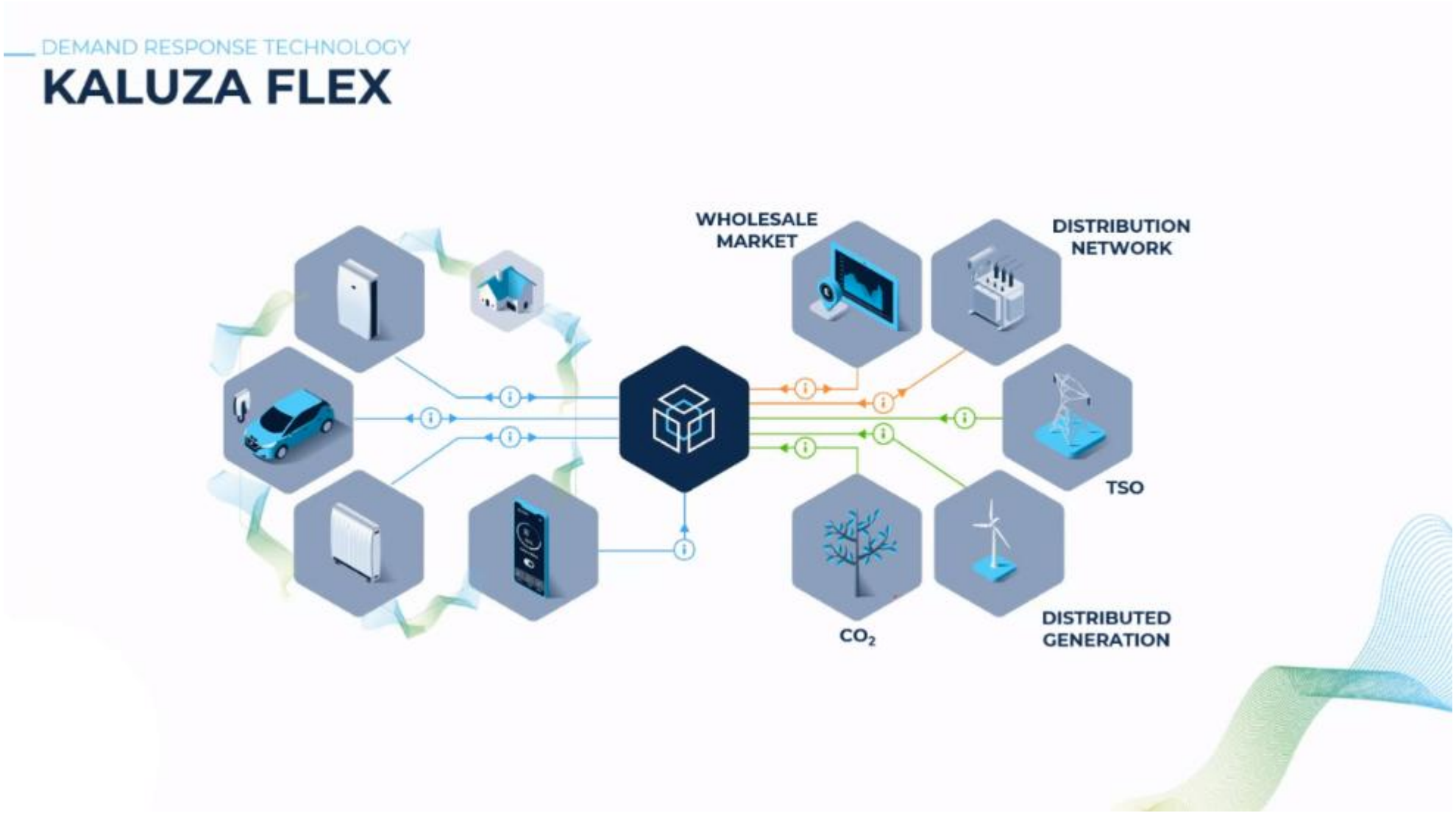
Insights, challenges, next steps

Value proposition
- Perception of bundle depends on type of customer and sustainability journey so far
- Educational aspect – importance of grid balancing

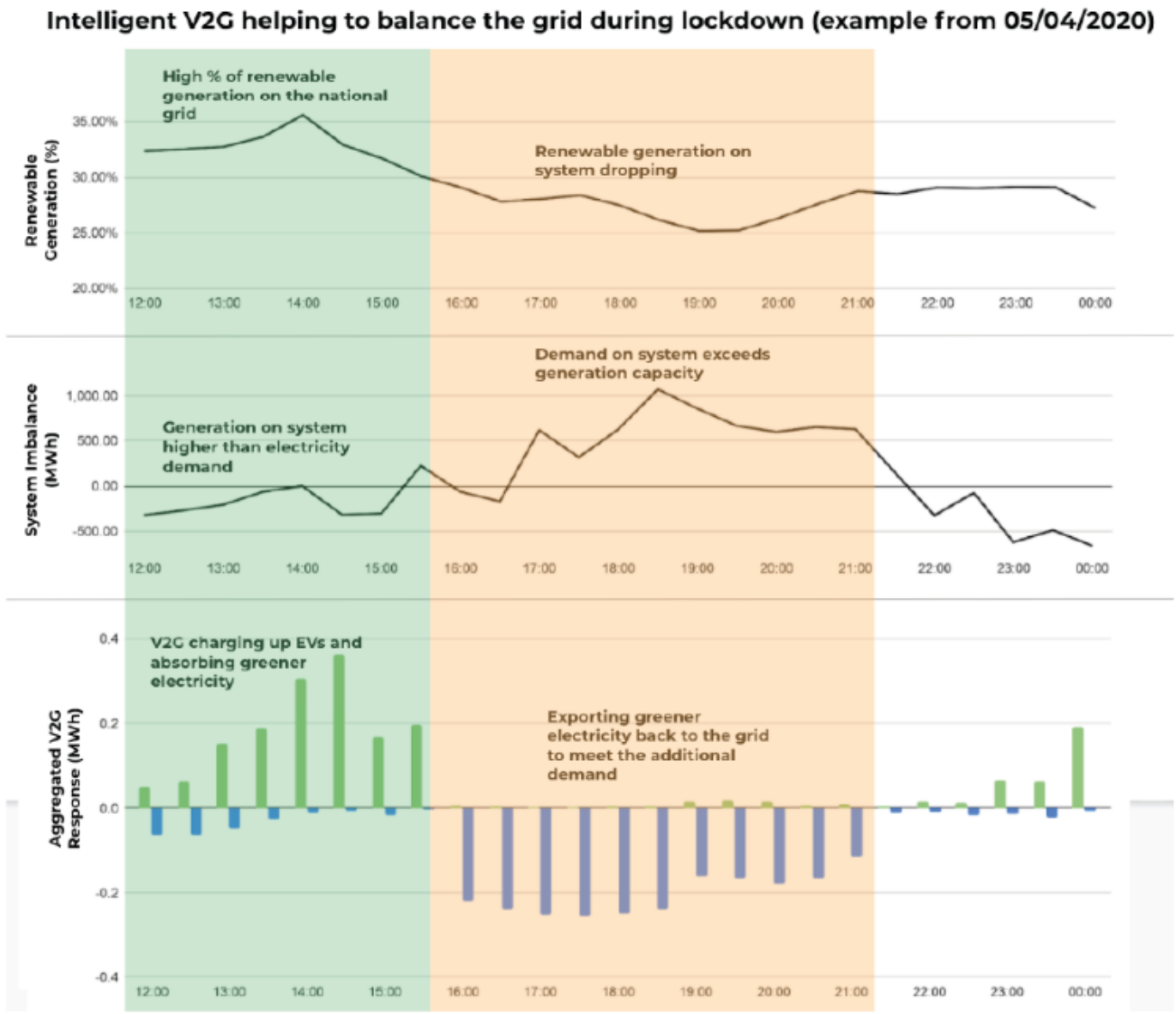
Challenges
- DNO connection
- Export limitations

Next steps
- Continuous recruitment
- Data collection and analysis

Kaluza Flex Architecture



Ovo Energy Project Sciurus



Source: Kaluza platform data

International flexibility standards

Demonstration of DSR with domestic EVs

Evergreen Smart Power

Evergreen’s VPP platform

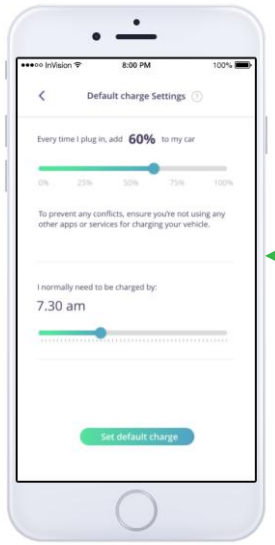
Evergreen’s cloud based VPP platform provides functionality to:

- Power consumer facing home optimisation propositions
  - Battery management
  - EV smart charging
- Provide grid services

Evergreen has native integrations directly with EVSEs and other devices. These allow Evergreen to:

- Monitor the status of a device
- Turn charging on or off according to preferences or specific optimisations (e.g. electricity price or carbon intensity)

Basic system architecture



User interface

Industry data

Evergreen's VPP platform

DNO/NGESO grid service delivery

Cloud interfaces to hardware

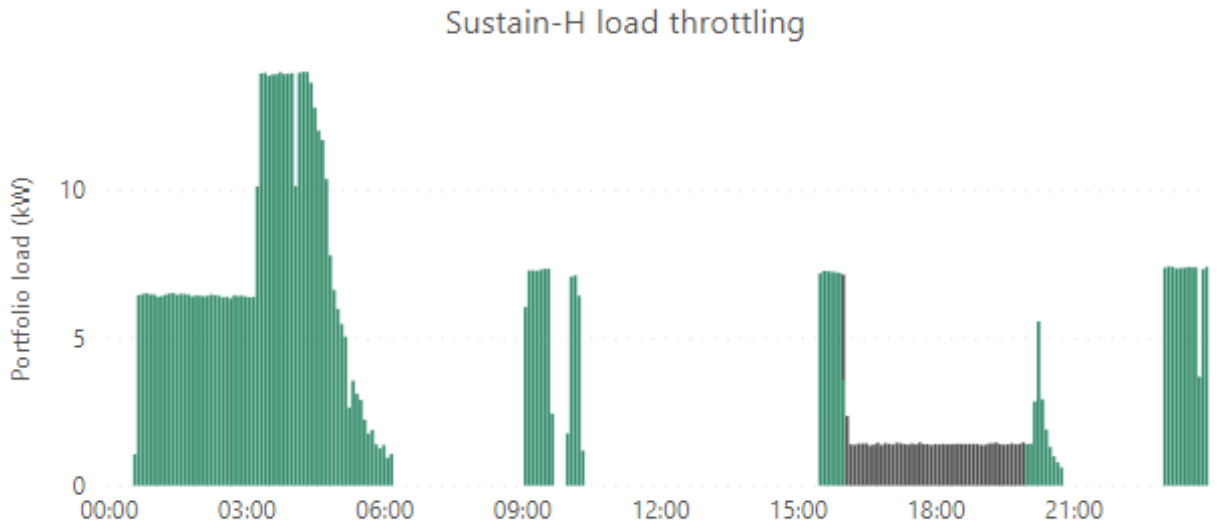
Smart controllable loads

(EVSE, battery, heat pump)

Using EVs for grid services

DNO flexibility service participation – Sustain-H

- WPD (a UK DNO) have been trialling using domestic assets in flexibility services as part of Sustain-H
- Participants were required to reduce load between the hours of 4-8pm to alleviate peak demand pressure on the grid
- Evergreen took part in the service and controlled EV chargers as part of the trial
- Sustain-H was a success and they are moving the procurement of the services into BAU
- Evergreen has won further contracts with other DNOs to provide grid services with EVs

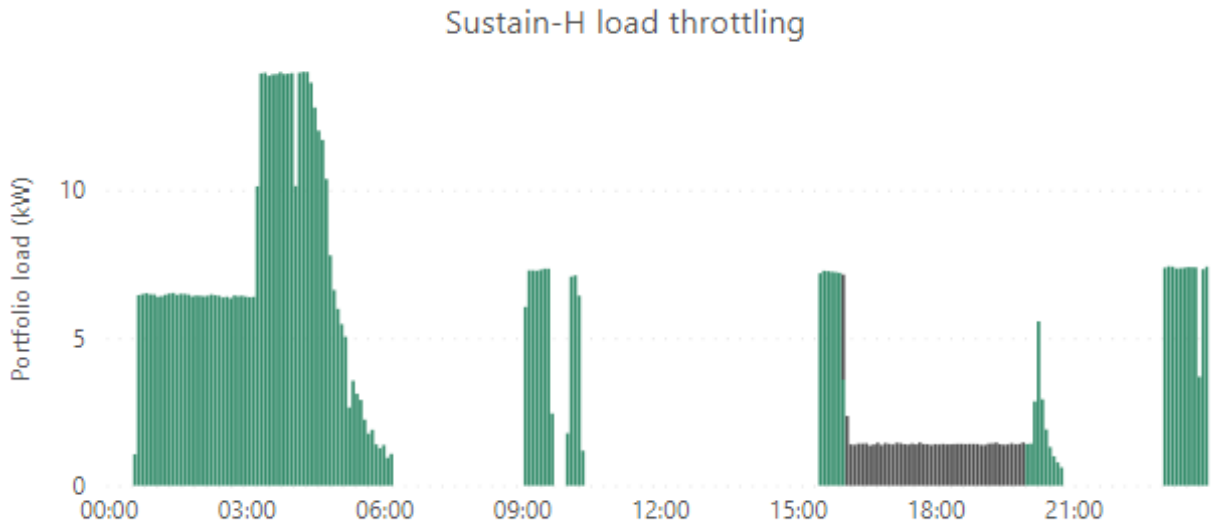


Source: Evergreen Smart Power data

Using EVs for grid services

Customer experience – Sustain-H

- Customer contracts with flexibility partner and agrees to have their devices throttled during periods of system need
- Evergreen's VPP automatically detects and reduces charging speeds in response to WPD signals
- Opt-out is available through charge point interface (opt-out exercised once in 9 month trial)

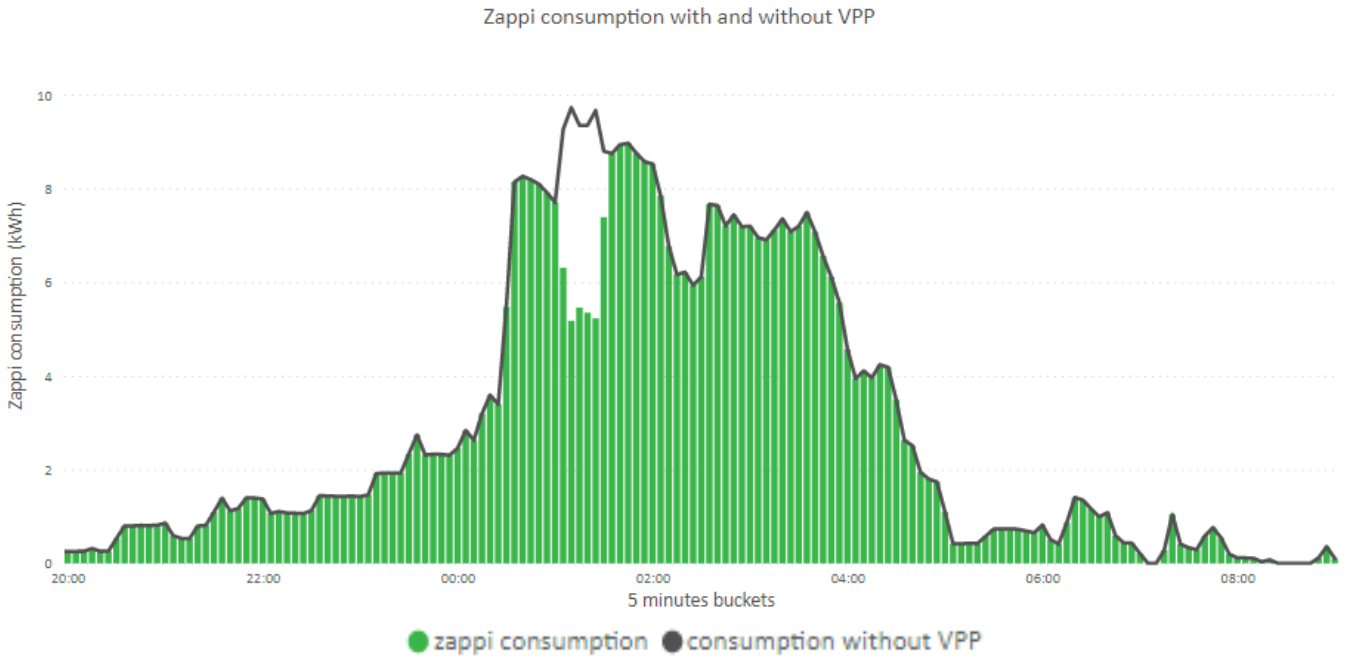


Source: Evergreen Smart Power data

Using EVs for grid services

ESO service participation - Balancing Mechanism demonstration

- Evergreen led BEIS funded Project FRED was aiming to demonstrate the potential of using EVs for participating in flexibility services
- Balancing Mechanism and other grid service demonstrations have been successfully completed with the fleet of EVs
- Evergreen will soon be participating in the Balancing Mechanism with aggregated domestic assets



Source: Evergreen Smart Power's Project FRED

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- **Sustain-H** - https://www.westernpower.co.uk/news-and-events/latest-news/we-have-launched-a-new-domestic-flex-pilot-to-help-customers-save-money
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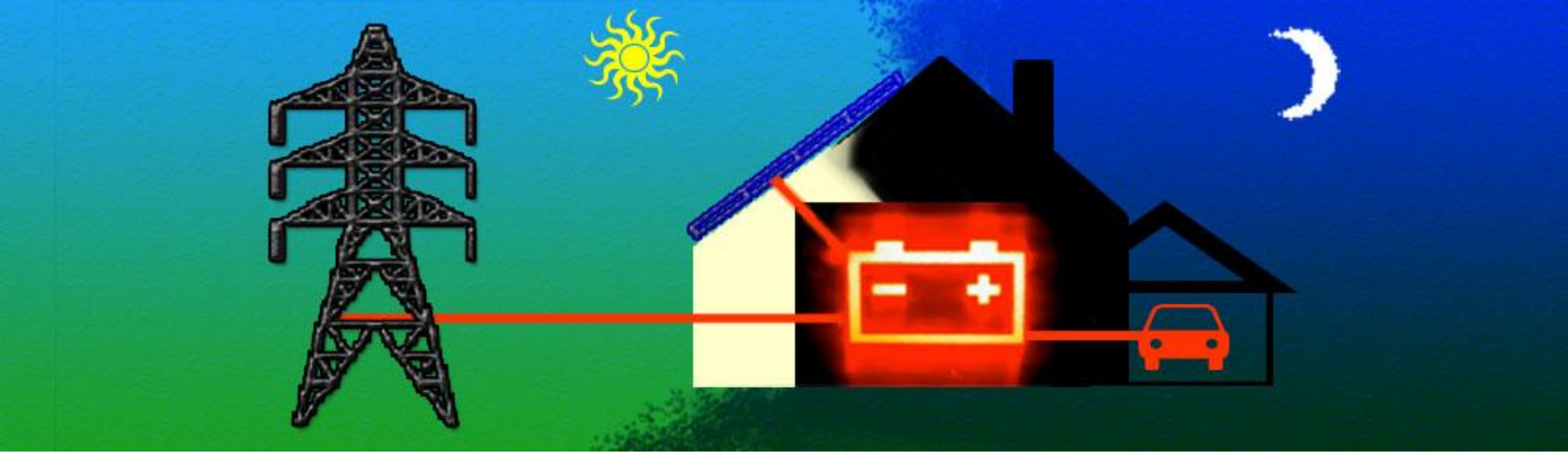

Any Questions?

Jim Hunt
V2G EVSE Limited
info@v2g-evse.com