

Interreg



EUROPEAN UNION

North Sea Region

SEEV4-City

European Regional Development Fund

V4ES: Quirks, Curiosities and Conclusions

The view from 1 house in Burton-upon-Trent, UK

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About Cenex

Reducing Emissions From Transport



Helping clients to assess, evaluate, implement and deliver low emission vehicle and associated infrastructure strategies

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Firstly, some definitions...

Quirk

/kwə:k/

noun

a peculiar aspect of a person's character or behaviour

Curiosity

/kjʊəri'ɒsɪti/

noun

an unusual or interesting object or fact



Vehicle for Energy Services (V4ES)

The intelligent management of stationary energy storage and electric vehicles (EVs) to provide services to the electricity system.

- V4ES is based on technology-driven solutions:
 - Stationary storage. I.e. second-life EV batteries
 - On-site generation. I.e. solar pv
 - EV charging and discharging. I.e. Nissan Leaf
- V4ES delivers benefits to multiple players in the electricity system:
 - Energy autonomy for the host
 - Ancillary services for the distribution grid
 - Environmental benefits for the grid
 - ...

(And yes, it is a term that we have made up...)



Cenex's history with V4ES follows the Gartner Curve

EFES /
SEEV4-city
Project kick-
off

Technology Trigger



Cenex's history with V4ES

Cenex installs
UK's first
domestic V2H
unit

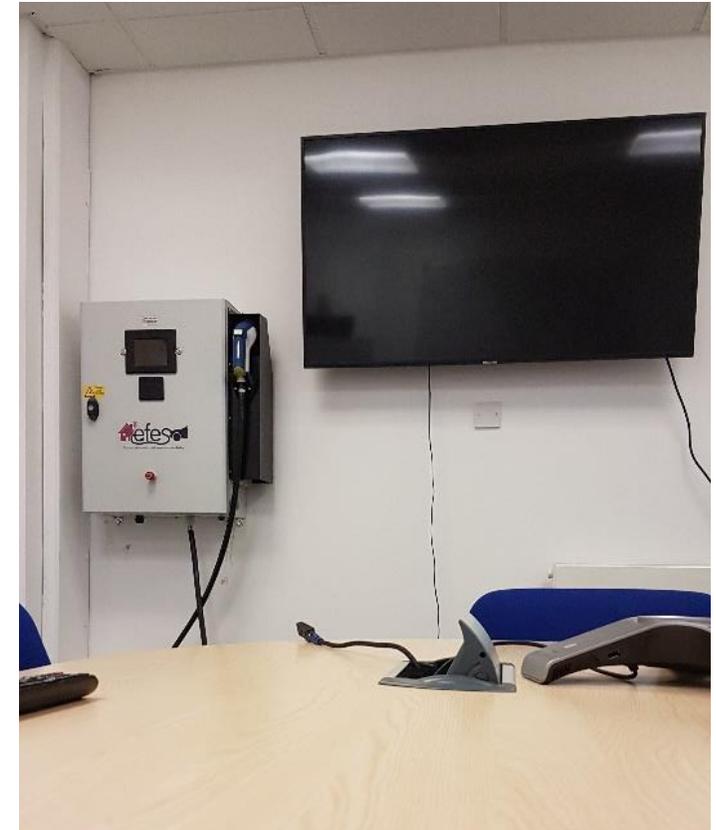
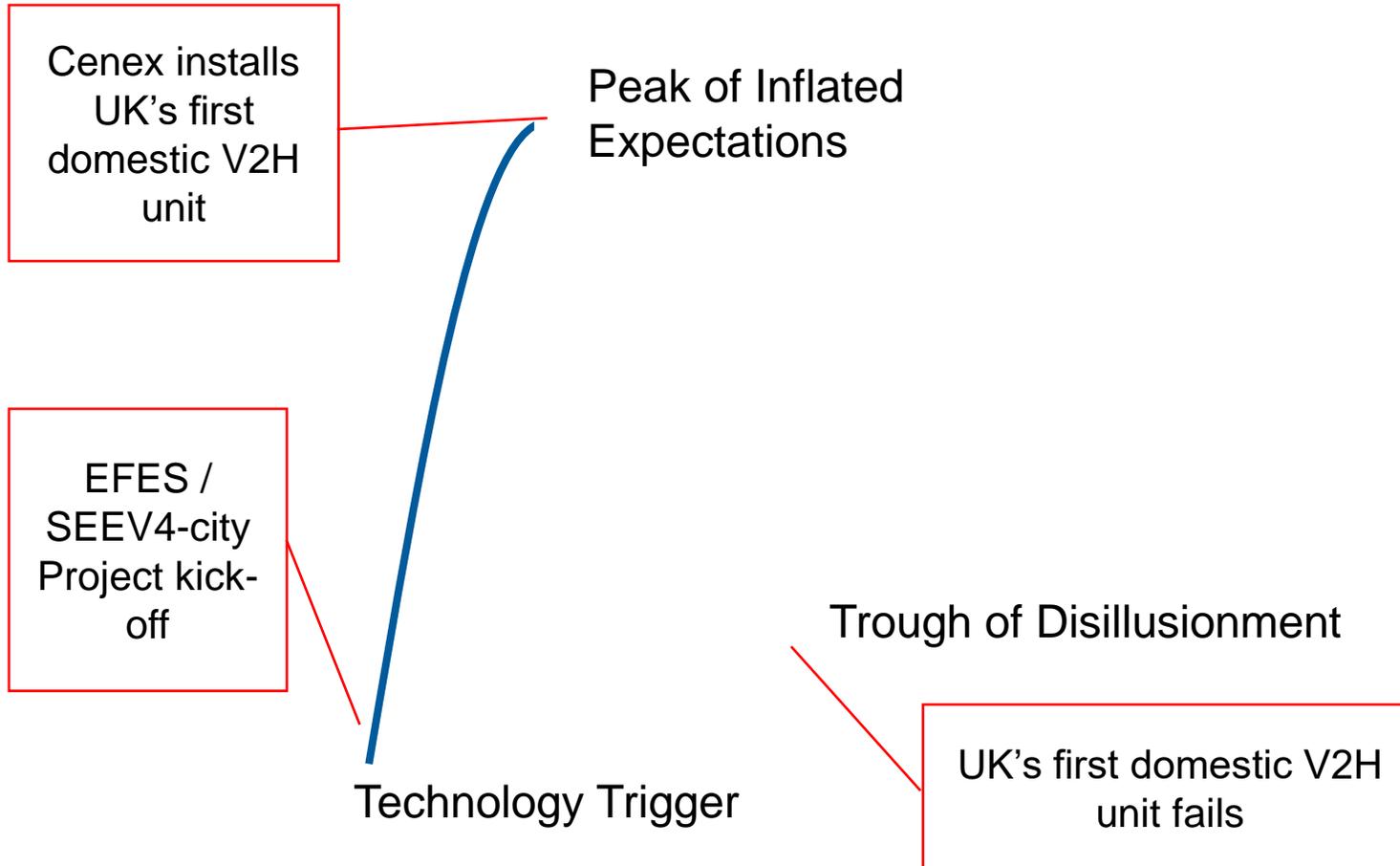
Peak of Inflated
Expectations

EFES /
SEEV4-city
Project kick-
off

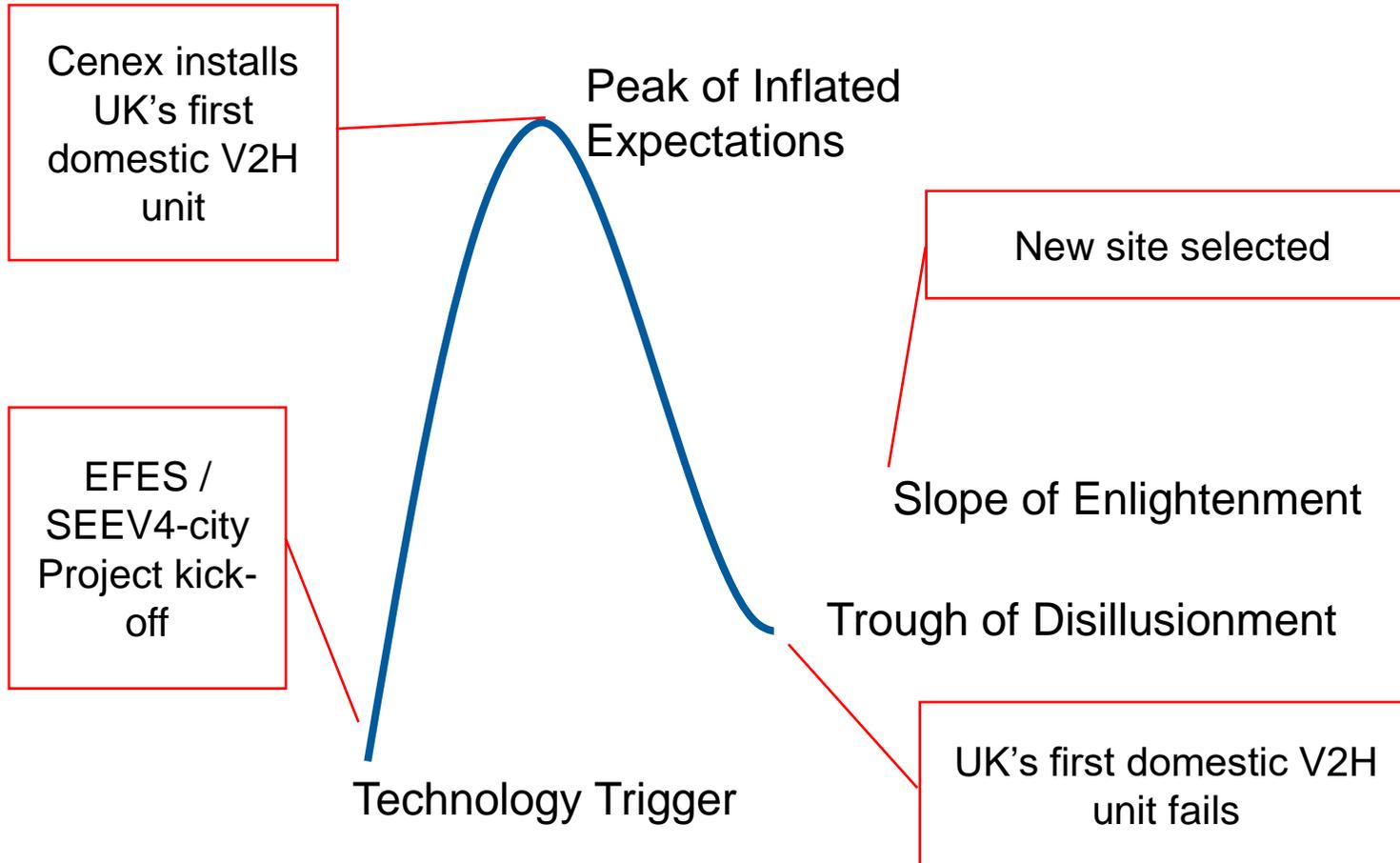
Technology Trigger



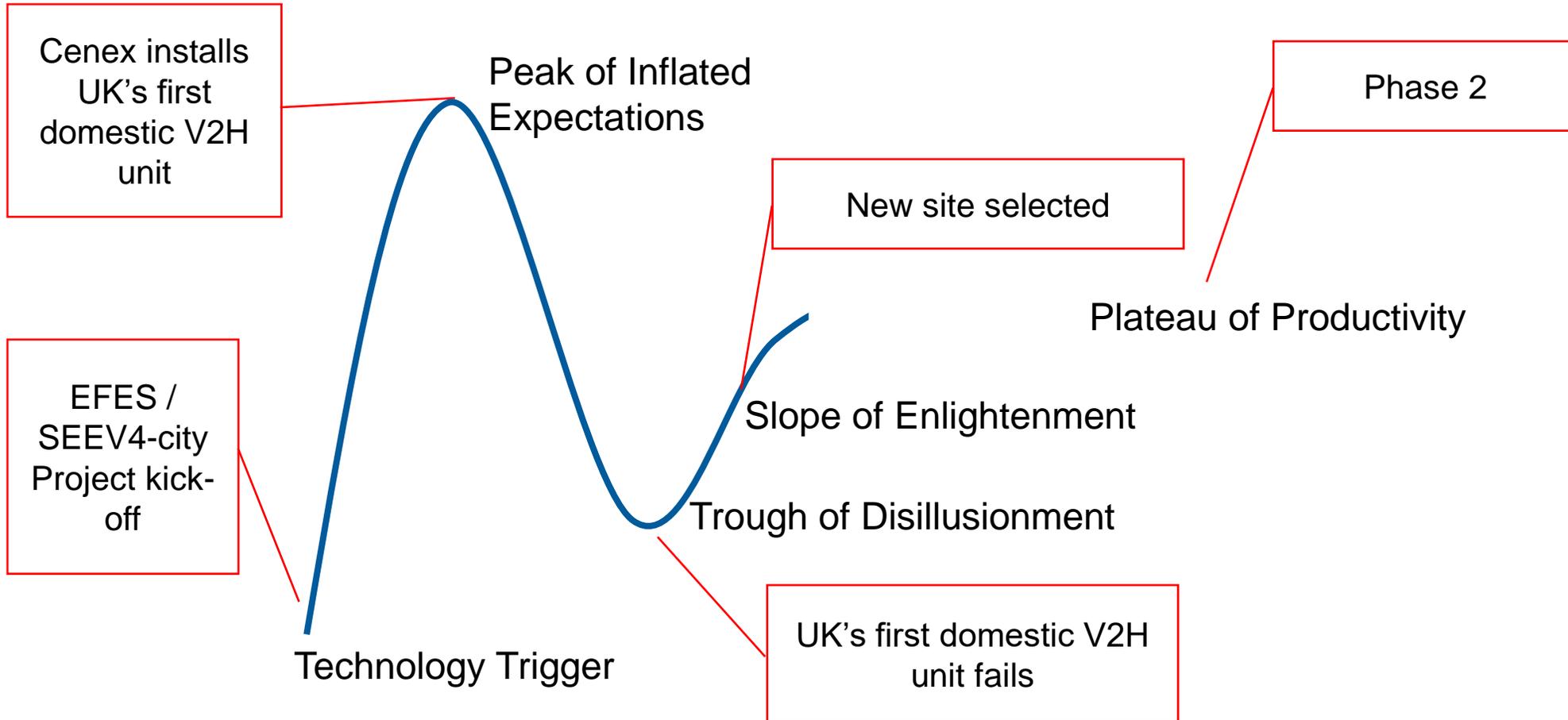
Cenex's history with V4ES



Cenex's history with V4ES



Cenex's history with V4ES



Our phase 2 pilot has built on these experiences

2016 - 2018

- 4 kWp PV array
- 2 kWh stationary battery
 - 400W fixed input / output
- Control system by Moixa
- 2012 24kWh Nissan LEAF
- V2G unit from EFES
 - Never actually V2G-ed!

- First domestic V2G unit in the UK, very early technology which suffered from reliability problems

2019 -

- 3.86 kWp PV array
- 3 kWh stationary battery
 - 760 W variable input / output
- PV + battery control system by Moixa
- 2018 40 kWh Nissan LEAF
- V2G unit from Ovo Energy
 - 7.3 kW charge
 - 3.68 kW discharge

- Market-ready products, backed by commercial SLAs, guarantees and warranties



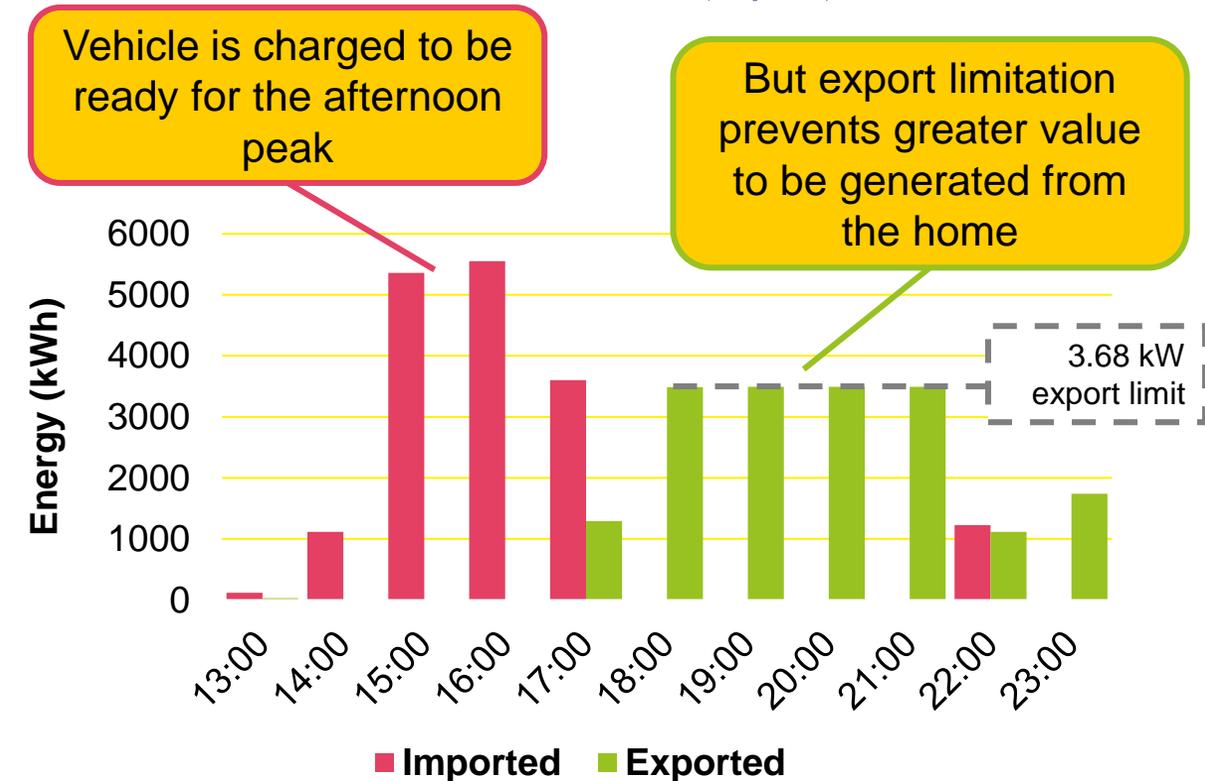
We're still analysing but already we are seeing some quirks and curiosities

1. Networks are both a help and a hinderance
2. Equipment efficiency erodes effectiveness
3. V4ES increases consumption
4. Controls must communicate



Networks are both a help and a hindrance

- Networks are essential to the operation of the electricity system
- They are bearing the brunt of the sustainable energy and electric vehicle revolution:
 - Peak loads increasing, electrical flow changing, legislation evolving...
- They are a massive **help** for V4ES by providing many interesting value pools
- But... their constraints also **hinder** V4ES
 - Our Burton on Trent site export is limited to half its potential due to network constraints

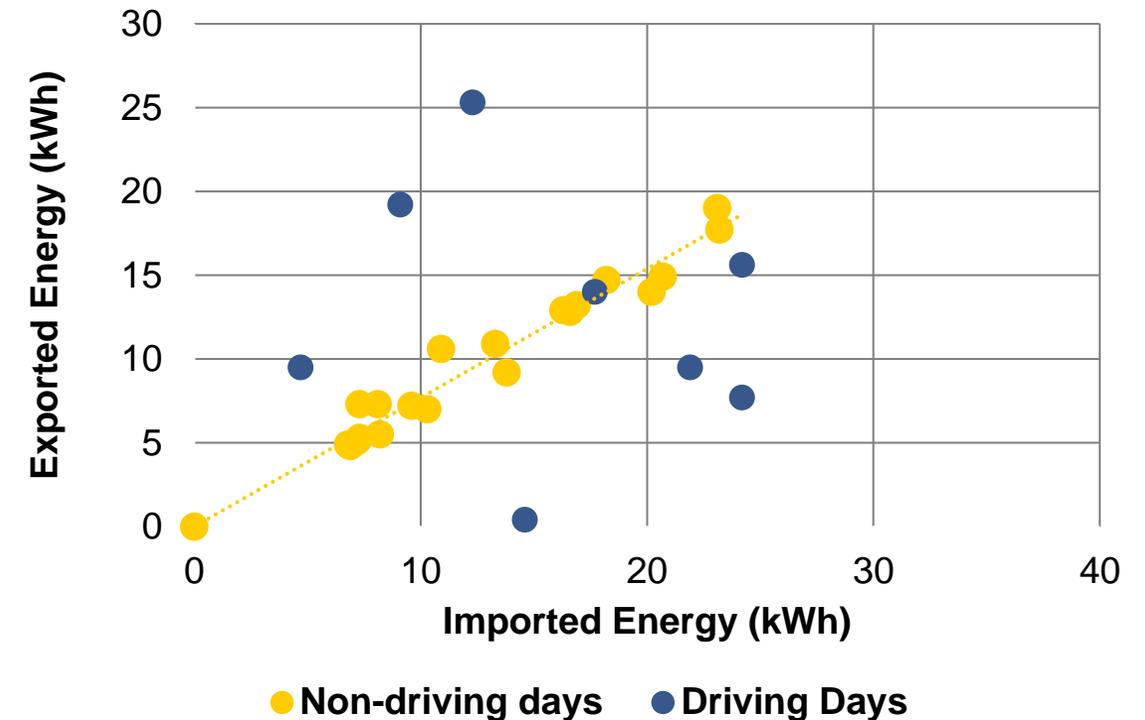


➤ Areas of the network most needing V4ES are most likely to require limitations on its operation



Equipment efficiency erodes effectiveness

- The UK lockdown has allowed us to explore the efficiency of the V4ES system
- Our EV has been *very stationary* storage!
 - Electricity metered, then converted from AC to DC to charge the EV
 - The EV battery discharges, which is converted to AC before being metered as it is released into the home and/or grid
- We noticed that when there is no driving, energy imported and exported correlate
 - 78% efficiency observed

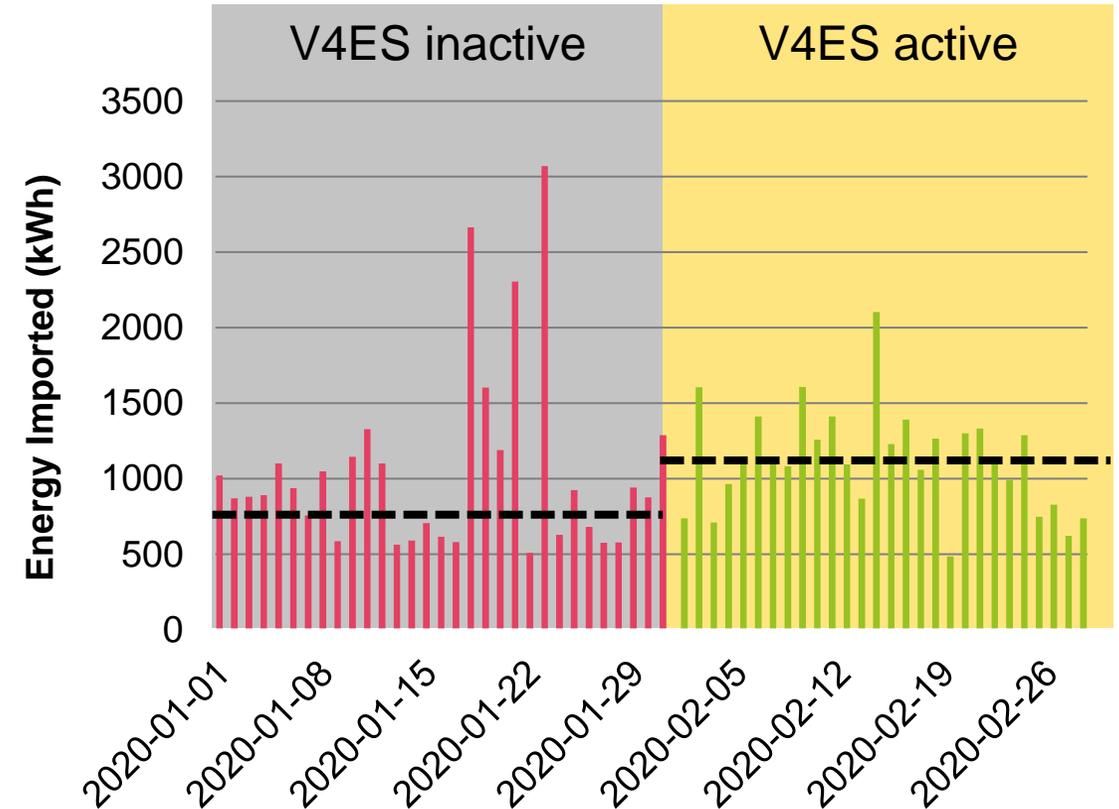


➤ Round-trip efficiency has a significant impact on the effectiveness of V4ES to deliver benefits



V4ES increases consumption

- The provision of V4ES means:
 - Energy flows to and from assets
 - Energy is imported to charge the EV
 - Energy is exported to discharge
- Mean import increased 9% when V4ES was switched on
 - This replaces energy exported for services
 - Supplier uses “export credits” to account for this, but they are only valued at ¼ of import
 - The net increase is small for a home (~£20 extra per year) but at scale could represent a significant additional cost

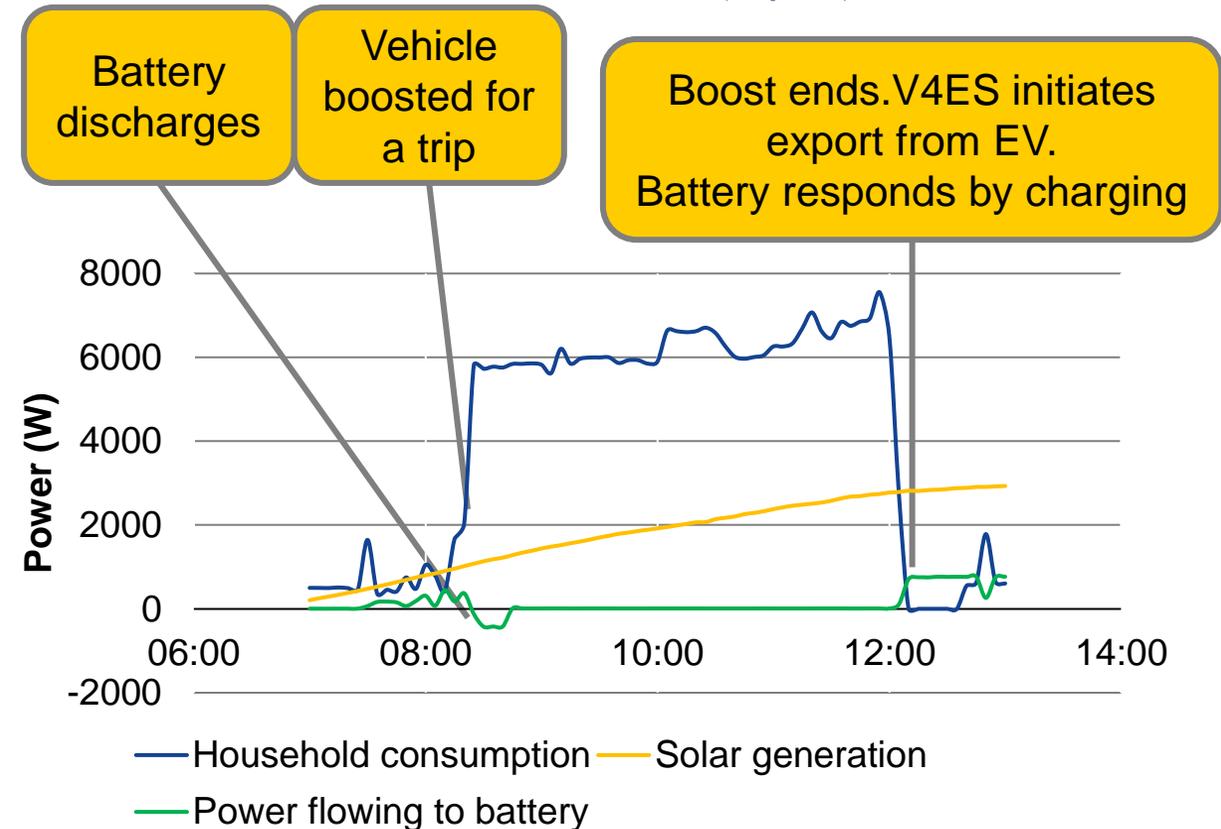


➤ Any commercial V4ES solution will need to ensure the customer is not out of pocket



Controls must communicate

- The phase 2 pilot uses systems from 2 commercial suppliers
- These have different control strategies informed by different data points
 - PV + Battery + Energy Manager tracks household energy balance
 - V2G + Backend tracks grid services
- Thus far, this means they have not conflicted but they also miss opportunities to take advantage of a holistic view
 - Well-exemplified by Monday 20th April



➤ The best V4ES systems will include a holistic view of all energy flows and coordinate all assets



V4ES Quirks, Curiosities and Conclusions

Observation	Insights
Networks are both a help and a hinderance	Areas of the network most needing V4ES are most likely to require limitations on its operation
Equipment efficiency erodes effectiveness	Round-trip efficiency has a significant impact on the effectiveness of V4ES to deliver benefits
V4ES increases consumption	Any commercial V4ES solution will need to ensure the customer is not out of pocket
Controls must communicate	The best V4ES systems will include a holistic view of all energy flows and coordinate all assets



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Thank you for listening

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