Commercially Viable V2X

Mark Potter, CTO

3ti®

Driving on Sunshine®

Clients include:

Silverstone

VEOLIA

Bristol Airport
Amazing journeys start here

Ministry of Defence

BENTLEY

BARCLAYS

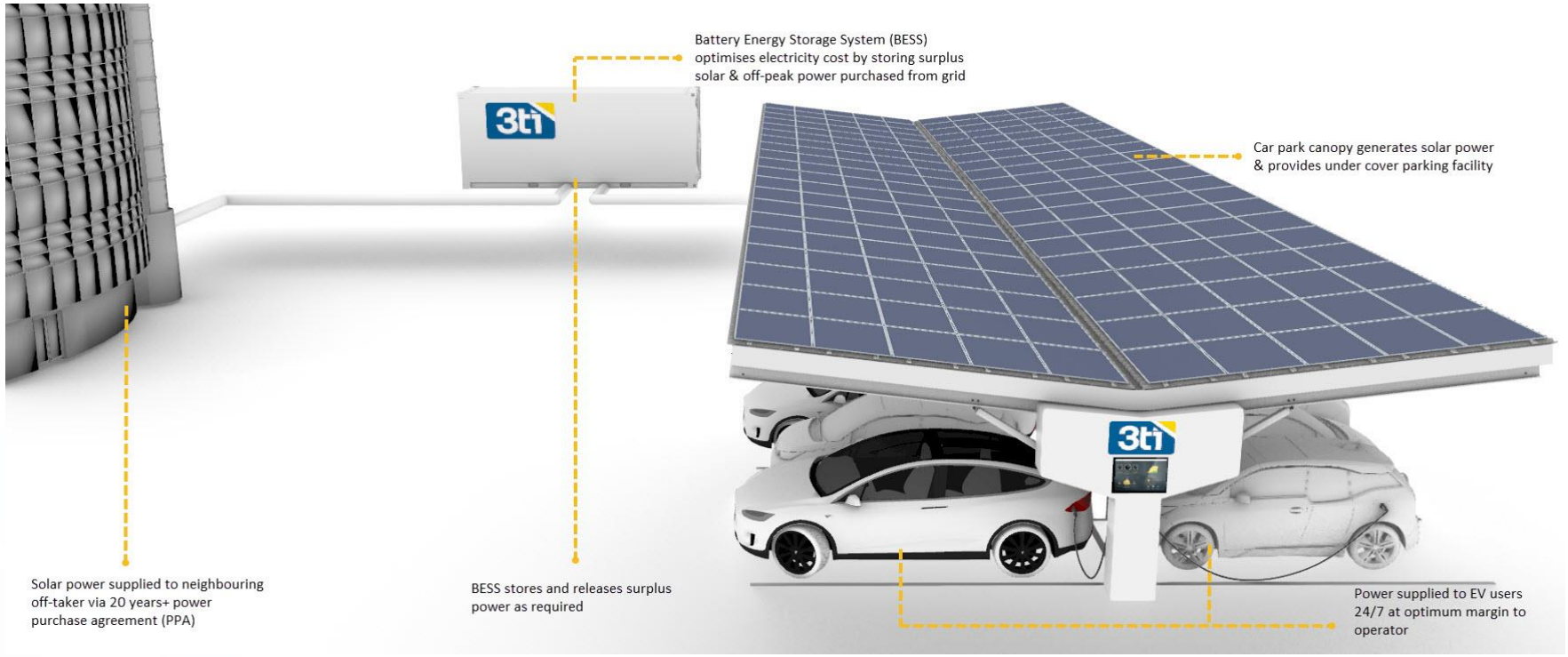
J.P.Morgan

NHS

Certified B® Corporation

3ti - the solar car park company

Three Technology Infrastructure – Solar, Storage and EV Charging



BENTLEY

JPMORGAN CHASE & CO.

Papilio3 – the pop-up mini solar car park & EV charging hub

- 12x 22 kW charge points
- Blend solar & grid energy
- Boost existing grid connection
- Made from recycled containers
- Deployed in < 1 day
- Waterproof shelter
- Integrated LED lighting
- CCTV fitted on each end
- Remote monitoring
- Avoid peak power use

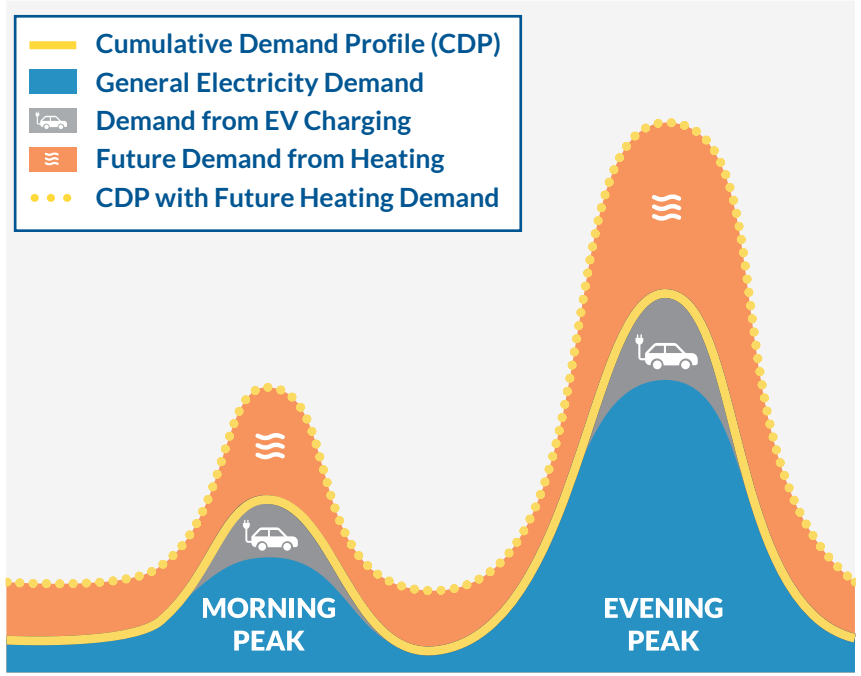
SILVERSTONE

Wiltshire COUNTY COUNCIL

Papilio3

V2X & Flexibility

Extra demand from EVs and Heating



Reduce peak electrical demand & use existing infrastructure capacity

Sell electricity back to the grid from a battery or EV "V2G"/"V2X"

Financial Reward

Participate in flexibility markets

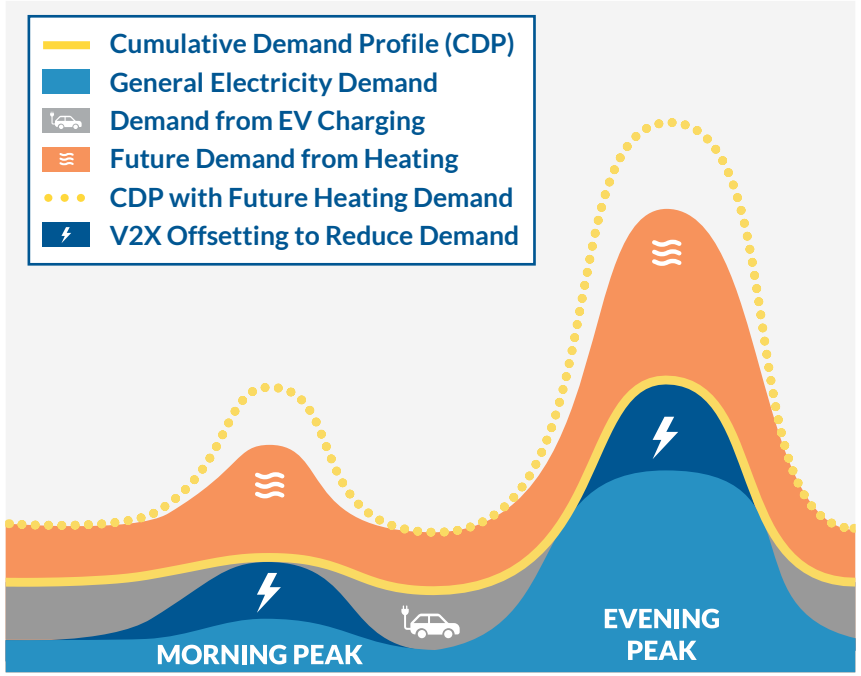
Energy resilience

Unlock back-up power supply

Grid Friendly

Better use of existing capacity

Flexible demand & V2X from EVs



Global application – every country faces the same issues

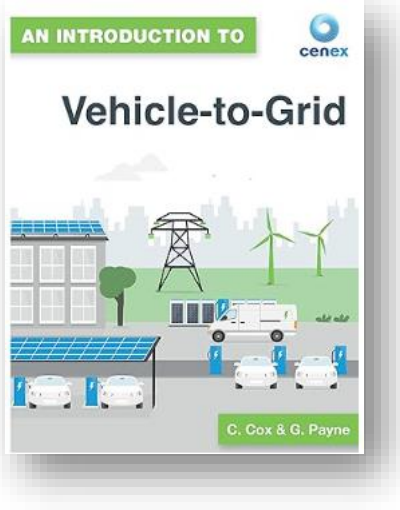
V2X Commercial Viability

- Cost & availability of charge points
- Infrastructure requirements
- EV technical capability
- Use cases, dwell time and power
- EV market saturation
- Regulatory framework
- Electricity tariff
- Flexibility markets
- Cost-benefit, battery considerations
- User participation
- User incentivisation

- High cost of infrastructure
- Market maturity & saturation

	Domestic	Small Commercial	Bus / Fleet Depot
Power Rating	7 kW	10 kW	50 kW
Projected Revenue	£200 - £500 /yr	£300 - £700 /yr	£1.5k - £3k /yr
Break-even Premium	~£1,000	~£1,500	~£7,000
Premium Horizon	2030+	2026 - 2029	Now

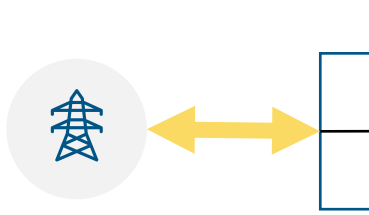
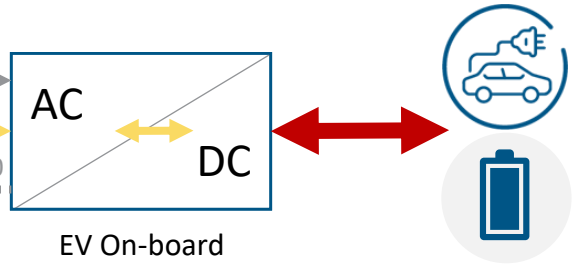
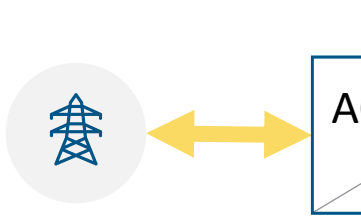
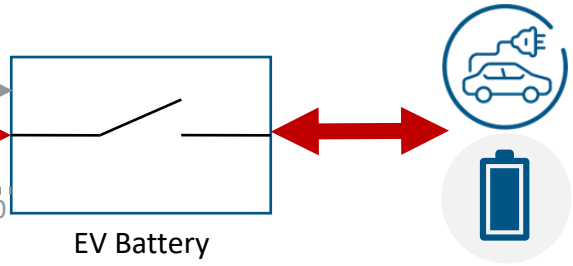
https://amzn.eu/d/4kM536i



Lower infrastructure cost will accelerate this timing – it's not *if*, it's *when*

AC vs DC V2X

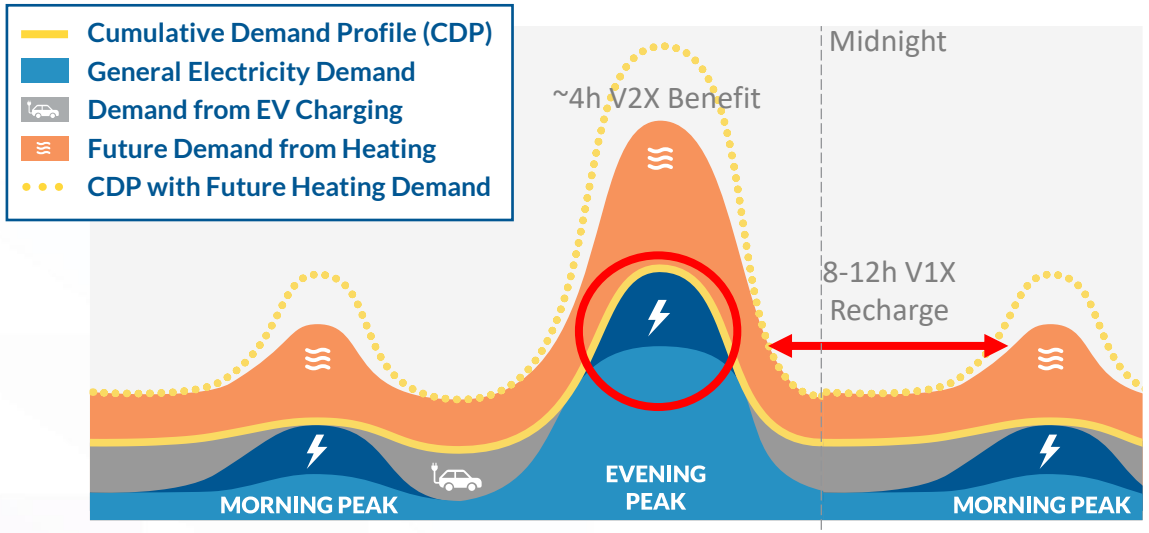
The grid is always AC – the difference is <u>where</u> battery DC becomes grid AC

	EV Charging Infrastructure (Off-Vehicle)	EV Equipment (On-Vehicle)	Max. Charge V1X (G>V)	Max. Discharge V2X (V>G)
AC V2X	 EV Charge Point AC Contactor	 EV On-board Charger (OBC)	7 kW 1-ph. 11-22 kW 3-ph. 30-45 miles/hour Most vehicles support 7&11 kW AC charging	3.6 kW 1-ph. 11 kW 3-ph. Some new vehicles support 3.6 kW V2L
DC V2X	 EV DC Charger	 EV Battery DC Contactors	Typ. 50-150 kW 200-600 miles/hour Few vehicles support 250+ kW charging	Typ. 15-100 kW Could be higher Mostly 15 kW from CHAdeMO

AC vs DC V2X: Primary Use Cases

AC V2X: Domestic / Long Dwell:

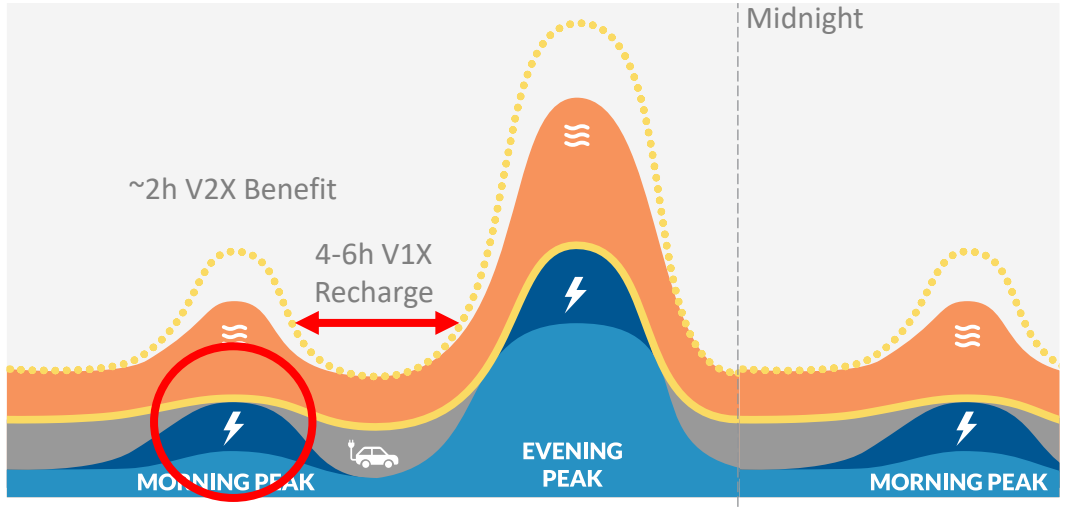
- A little power from a lot of vehicles: 3.6 kW x many
- Long recharge opportunity: 7 kW x 8-12 hr



- Smart V1X charging using low-cost off-peak electricity
- Charge point normally used 1-2 times per week

DC V2X: Workplace and Destination / Medium Dwell, typically:

- More power from fewer vehicles: 15 kW x few
- Shorter recharge opportunity: 30 kW x 4-6 hr



- Smart V1X charging using daytime solar energy
- Charge point used 5-10 times per week

V2X DC not generally useful for EV Transit Charging (50+ kW) locations; Users want to leave ASAP.

Fleet & HGV use cases are a little different; Focus here on Passenger Car and Light-Commercial EV

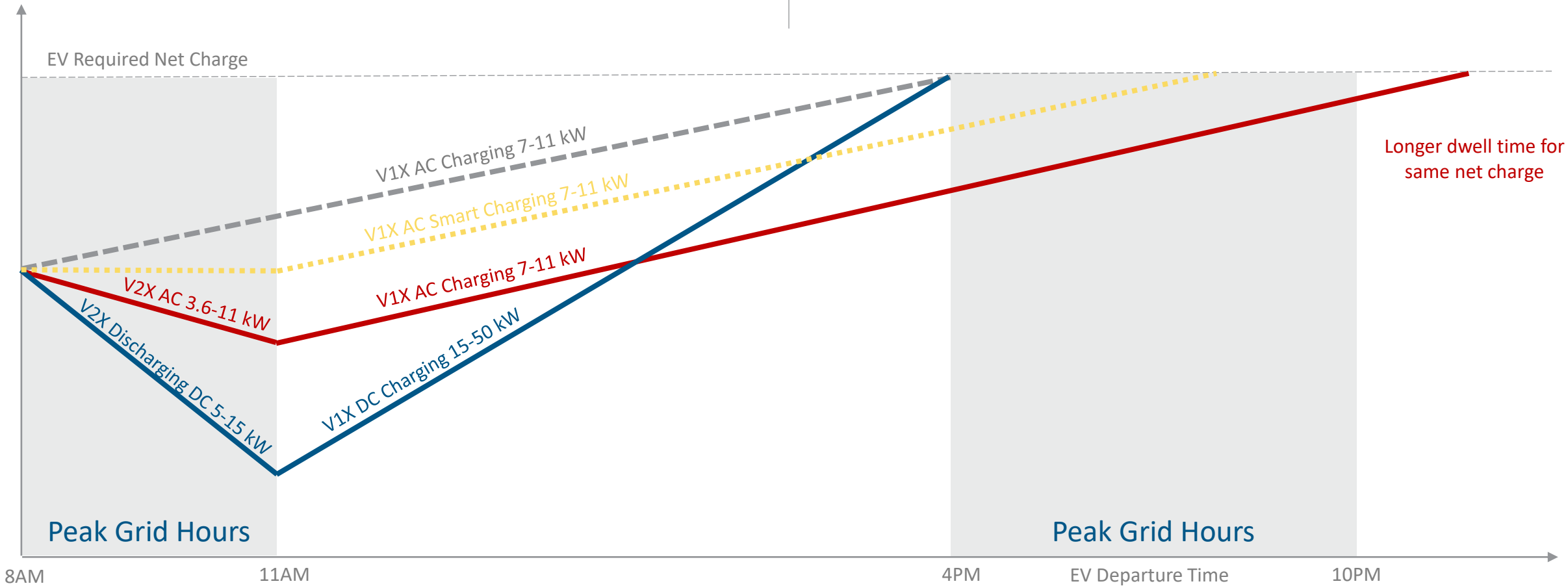
AC vs DC V2X: Charge & Discharge Rates

AC V2X, typically:

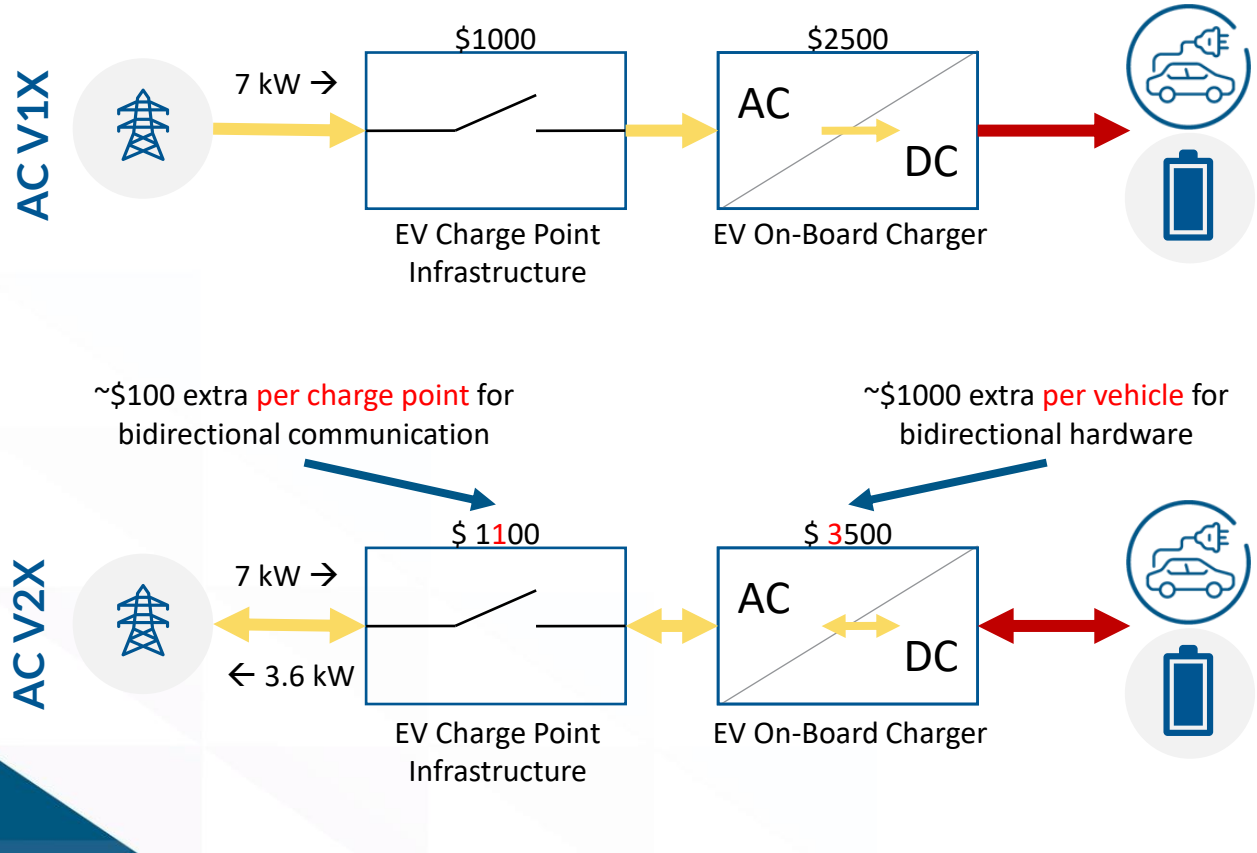
- 7 or 11 kW V1X (Charging EV Battery)
- 3.6 kW V2X (Discharging EV Battery)

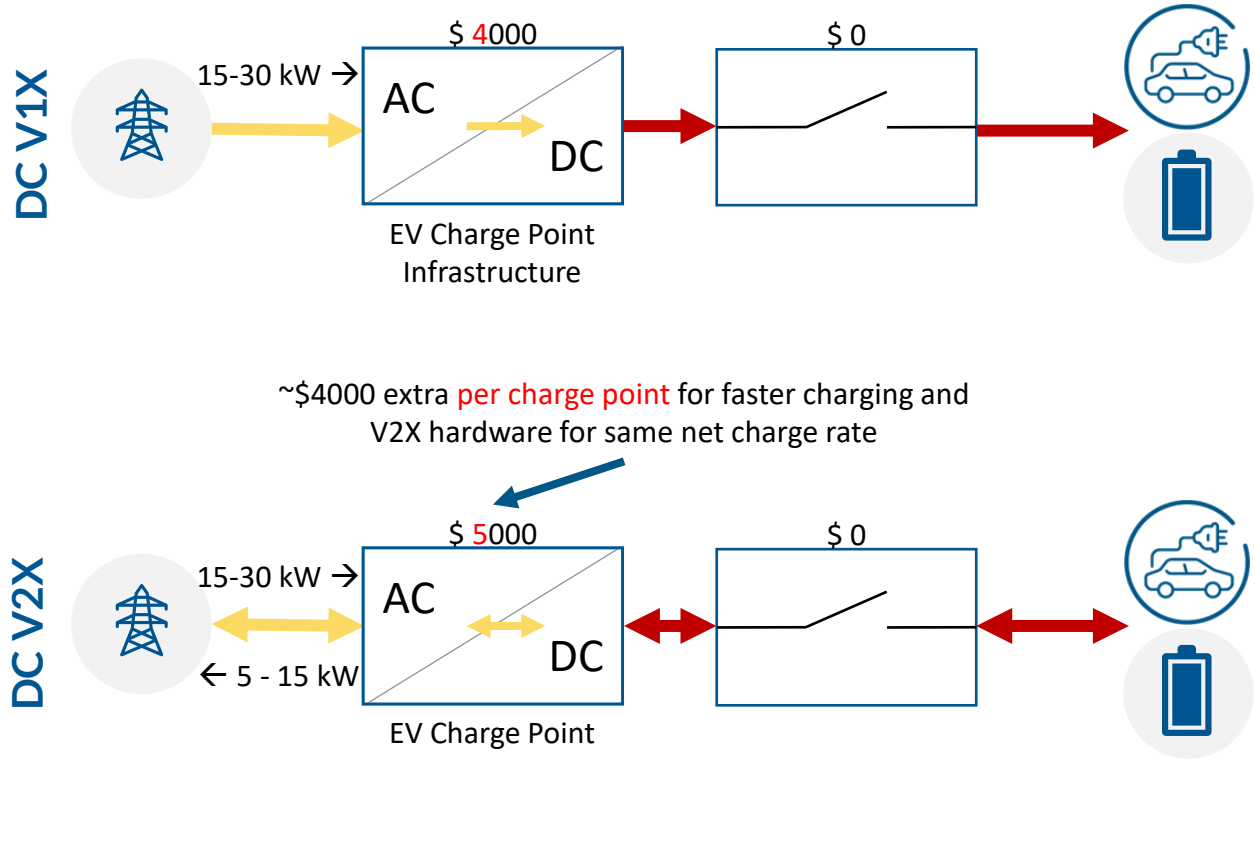
DC V2X, typically:

- 15 – 50 kW V1X (Charging EV Battery)
- 5 – 15 kW V2X (Discharging EV Battery)



Charging Infrastructure Costs



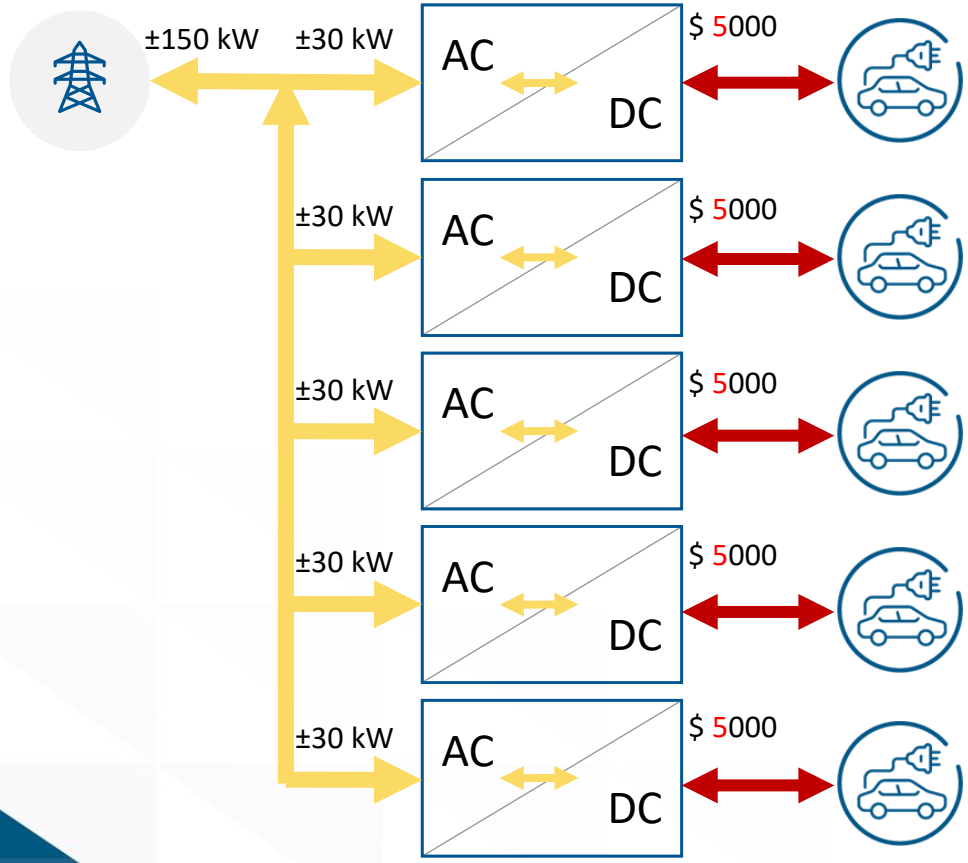


AC V2X Capability costs ~ £1000 / vehicle (illustrative)

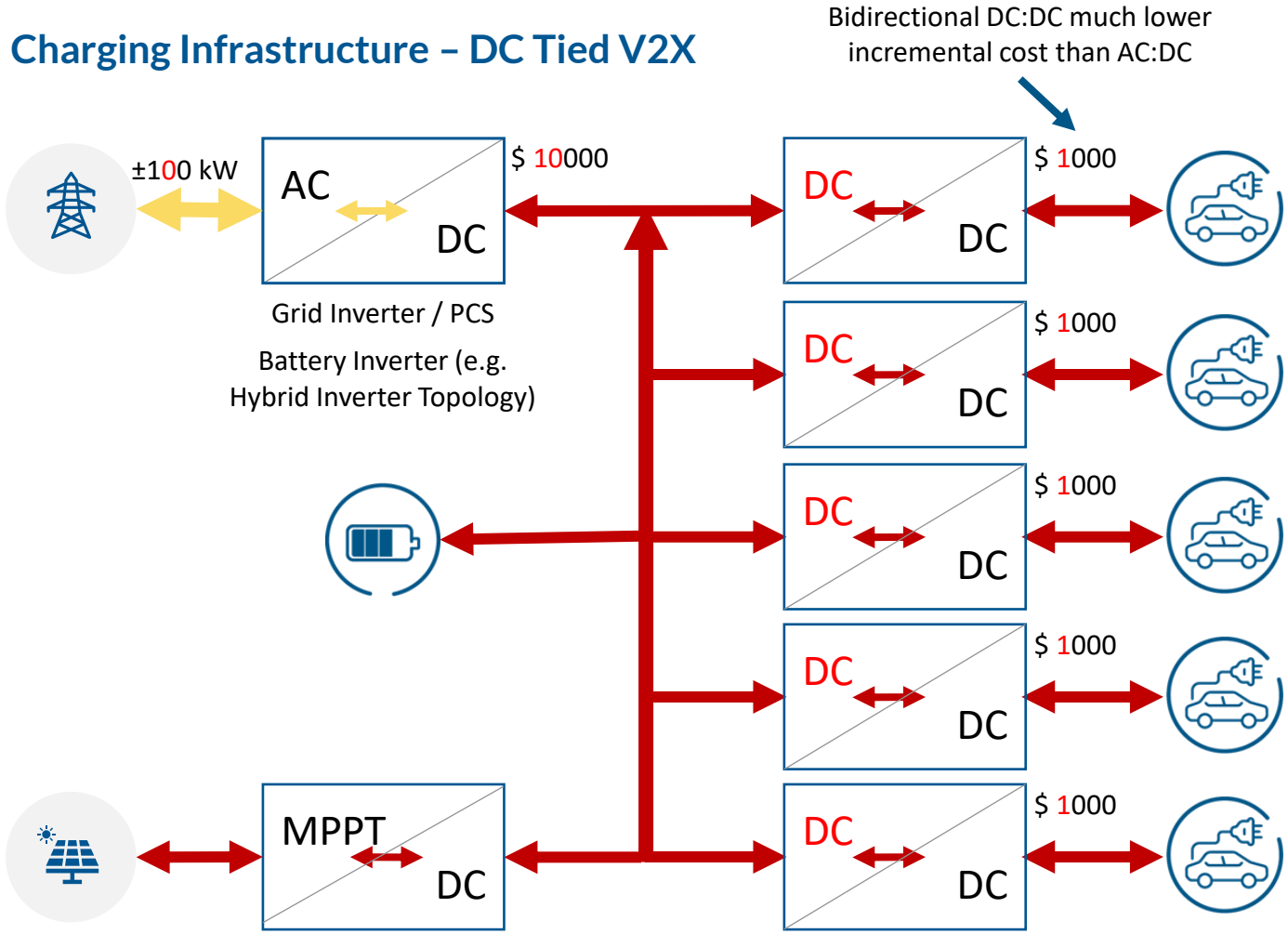
DC V2X Capability costs ~ £4000 / charge point (illustrative)

Microgrid Charging Infrastructure

Charging Infrastructure – AC Tied V2X



Charging Infrastructure – DC Tied V2X



AC Tied ~ $ 25000 vs. DC Tied ~ $15000 (illustrative) due to inverter hardware savings

Further cost savings with solar and storage and better conversion efficiencies

Papilio3 V2X Fast Hub

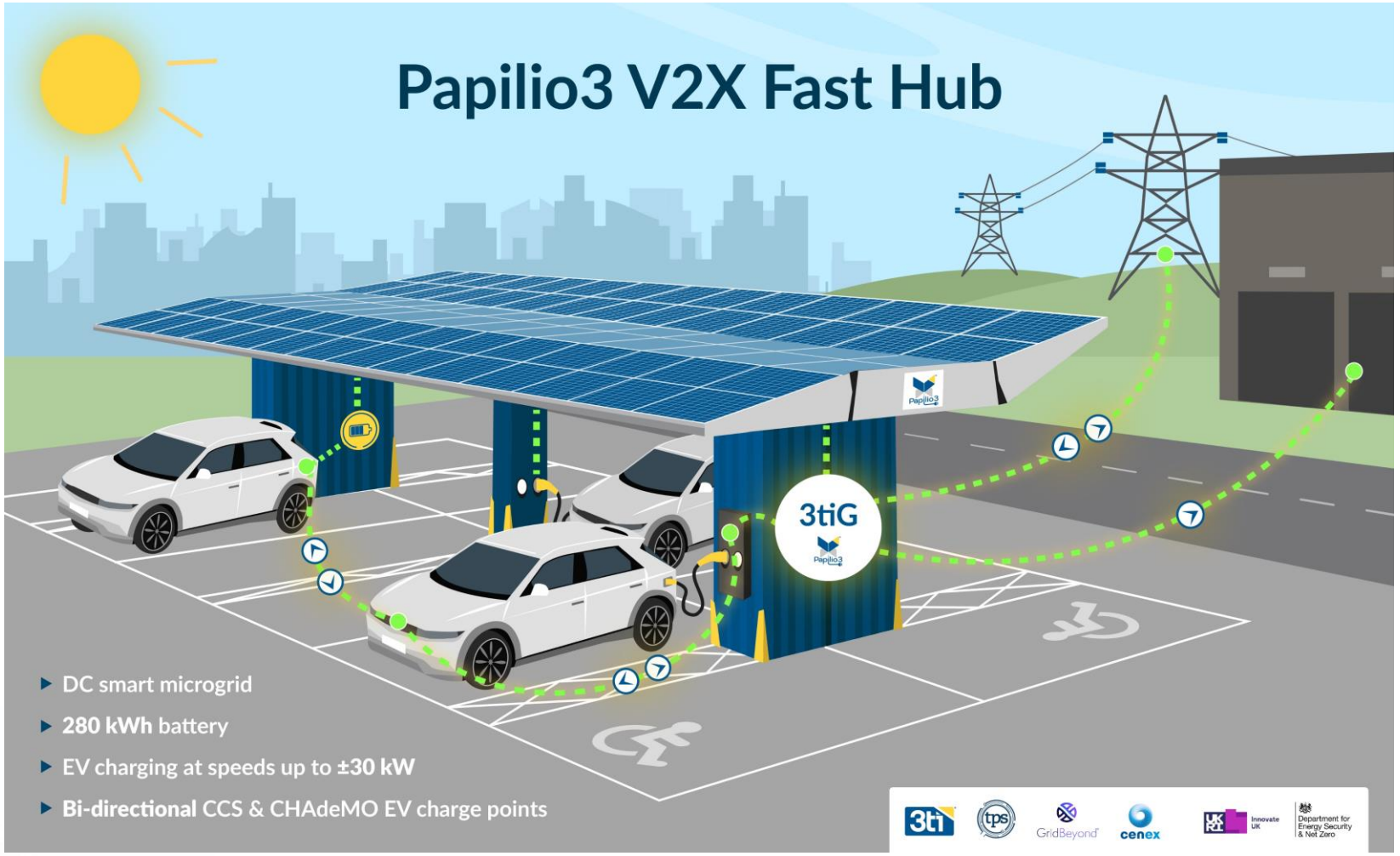
Funded by DESNZ, Delivered by Innovate UK

- 12x ± 30 kW DC
- CHAdeMO & CCS
- 280 kWh battery
- 20 kWp solar
- DC Microgrid

- 3tiG Control System

- Prototype Sep 2024

- Trials March 2025



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