The Context For Low Carbon Vehicles

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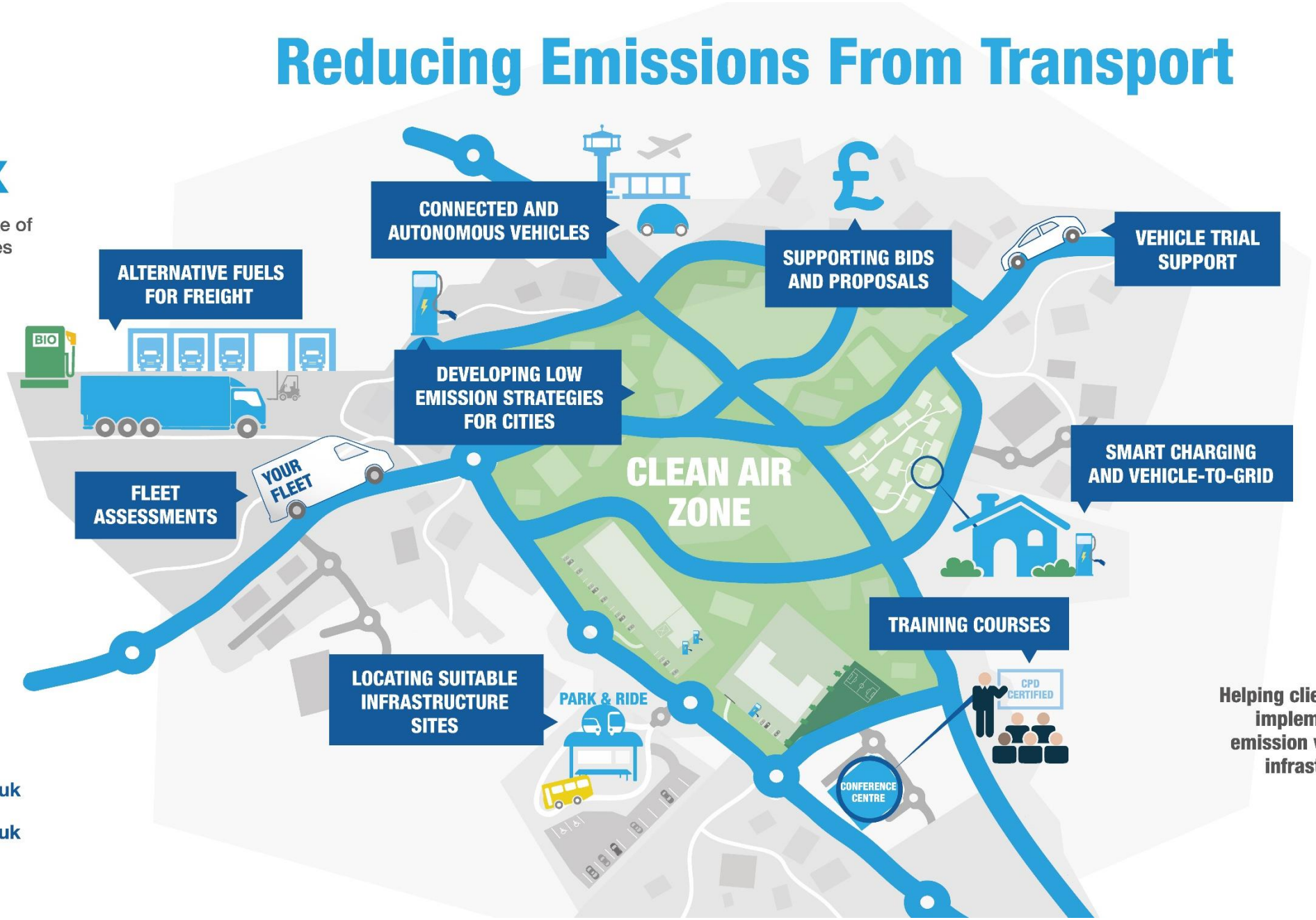
Agenda

1. Introduction to Cenex
2. Policy Influencers
3. Technology Overview
4. Innovation
5. “Perfect Procurement”
6. Where do we go next?

Reducing Emissions From Transport

cenex

Accelerating the uptake of low emission vehicles



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

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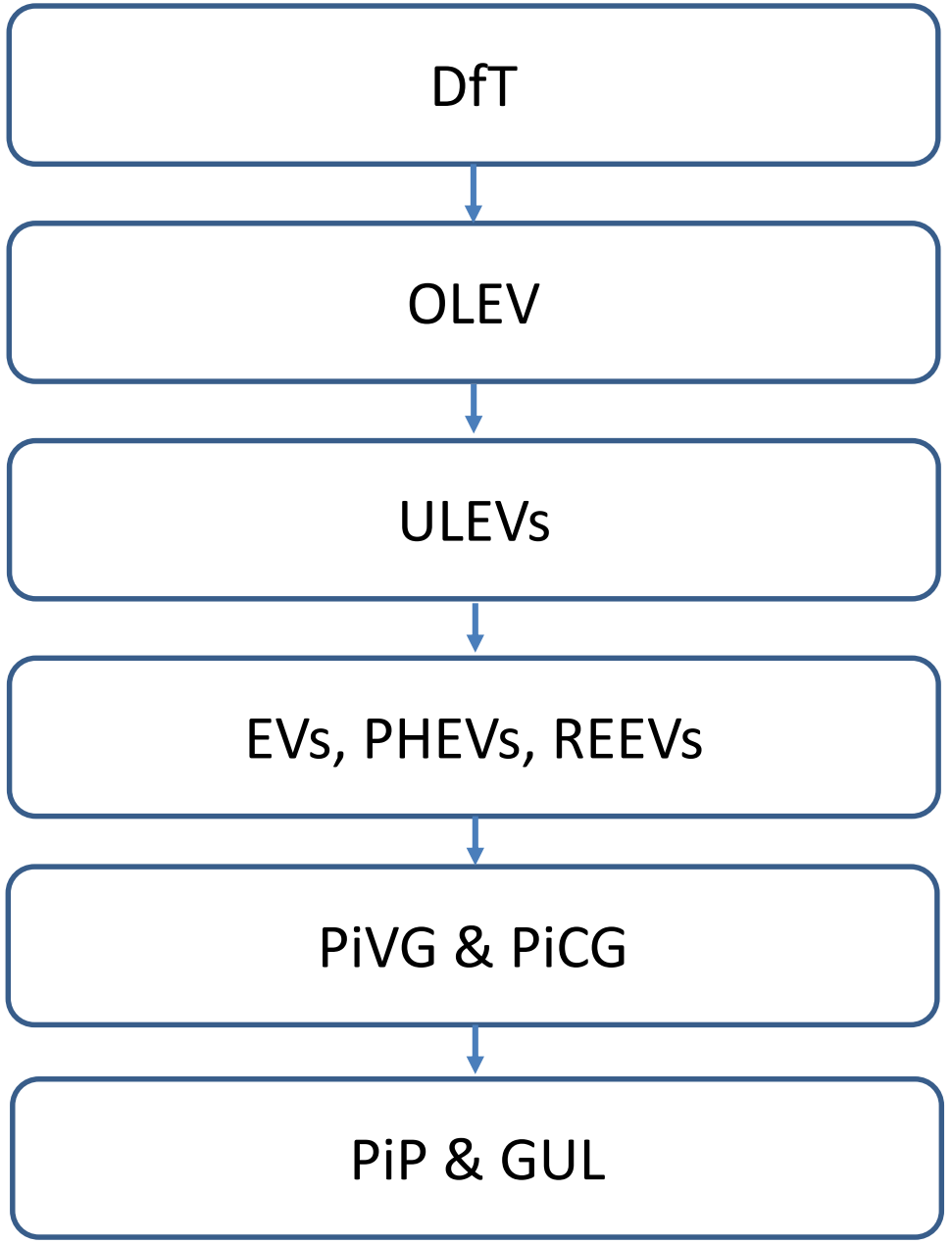
Policy Influencers

CAZ – Clean Air Zone
Euro IV, V, VI, EEV
ULEV – Ultra Low Emission Vehicle
PiVG – Plug-in Van Grant
PiVC – Plug-in Car Grant
OLEV – Office for Low Emission Vehicles
GUL – Go Ultra Low
EV – Electric Vehicle
PHEV – Plug-In Hybrid Electric Vehicle
CVTF – Clean Vehicle Technology Fund
LEZ – Low Emission Zone
RPC – Reduced Pollution Certificate
REEV – Range Extended Electric Vehicle
PiP – Plugged-In Places
Euro 4, 5, 6



Industry commitments are leading the change to ULEVs

VW plans for electric trucks and buses, starting production next year

China's electric car output to hit 1M next year, automaker says

"The trend is definite."

Volkswagen wants to fill the roads with heavy-duty electric trucks and busses

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Jaguar Land Rover

Jaguar Land Rover to make only electric or hybrid cars from 2020

Carmaker follows Volvo in spelling an end for petrol or diesel-only cars, despite not making any electric vehicles at present

All Volvo cars to be electric or hybrid from 2019

Landmark move as first big manufacturer says it will stop making vehicles solely powered by internal combustion engine

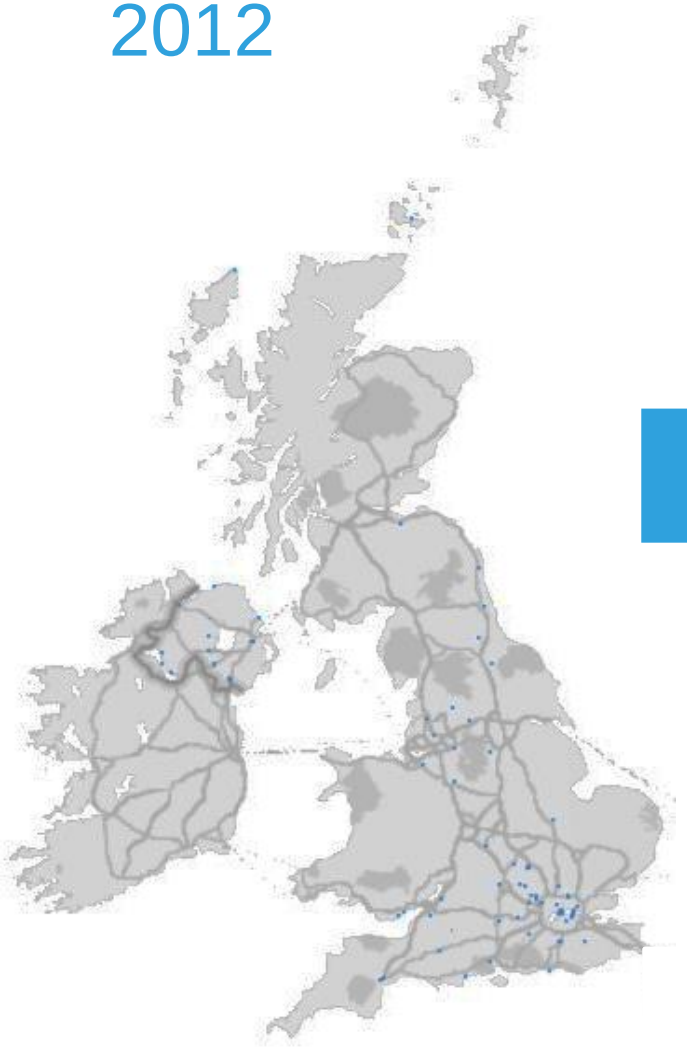
News › Business › Business News

Shell launches fast-charging stations for electric vehicles

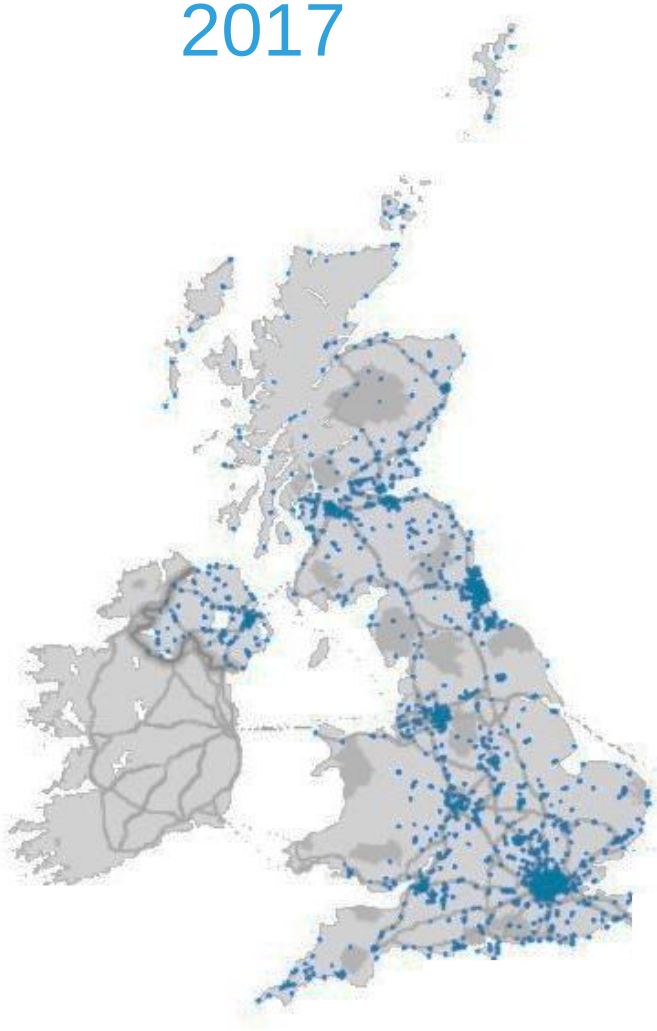
The first fast-charging stations are near London and in northern England

Electric vehicle status and development

2012



2017



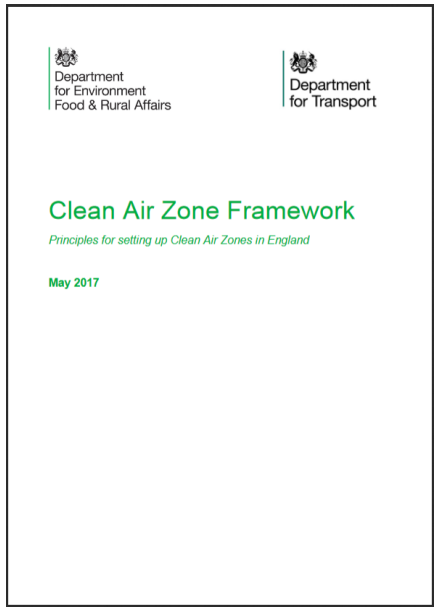
According to Zap-map, there are 14,593 connectors, 8,473 devices and 5,100 locations for charging infrastructure as stated on 29 January 2018.

Seeing a move from ‘range anxiety’ to ‘charging anxiety’; how long will I need to queue to get access to a charge point?

Battery range is increasing, so will this be a problem?

Clean Air Zones, Air Quality Management Areas

- There are over 650 AQMAs in the UK
- CAZ Framework released in 2016
- A CAZ's primary function is to reduce NO_x (Nitrogen Oxides) levels
- Euro 6/VI diesel is good enough to meet minimum compliance for now
- The framework describes the principles by which CAZs should be set up and run. '**ultra-low emission vehicles with a significant zero emission range will never be charged for entering or moving through a CAZ' , 'One of the aims of Clean Air Zones is to support the transition to ULEVs (Ultra Low Emission Vehicles)'**
- The CAZ framework instructs authorities to explore all non-charging methods before justifying the use of a charging zone. Five English cities have been **mandated to create a CAZ by 2020; they are Leeds, Derby, Nottingham, Birmingham & Southampton. The Draft UK Air Quality Plan also identifies a far.**
- 15 zones which are required to develop a CAZ plan by March 2018, and a further seven required to develop a local action plan due to NO_2 exceedances on just one stretch of road.


Department for Environment Food & Rural Affairs

Department for Transport

Clean Air Zone Framework

Principles for setting up Clean Air Zones in England

May 2017

Air quality policies and regulations

Oxford

Oxford aims for world's first zero emissions zone with petrol car ban

Council plans to start phasing out polluting vehicles including taxis, cars and buses from city centre area in 2020

Edinburgh and Glasgow square up over first Low Emission Zone

Both Edinburgh and Glasgow are vying to secure the pilot scheme. (Photo by Daniel Berehulak/Getty Images)

Norway to 'completely ban petrol powered cars by 2025'

'What an amazingly awesome country', Elon Musk tweeted in response to the plan

Jess Staufenberg | Saturday 4 June 2016 | 264 comments

118K shares

2016/04/01

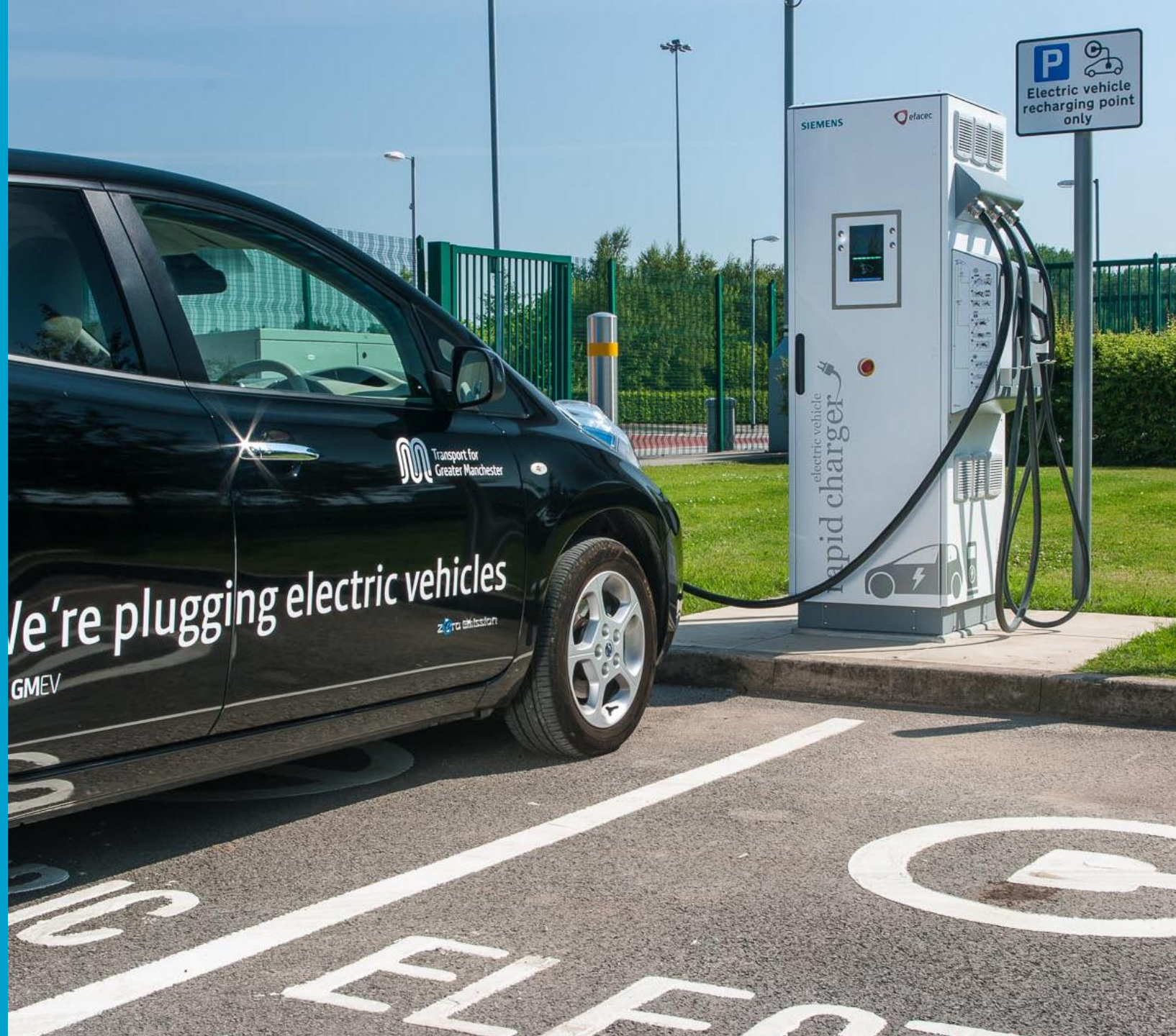
Several European Countries to Follow Norway's Lead, Ban Fuel-Powered Cars

Following plans by the government of Norway to ban cars fueled by petrol or diesel by 2025, several other countries in Europe are formulating similar programs to phase out fuel-powered transportation. Moreover, sources close to the European Parliament say that once multiple member states pass such a ban as is expected later this year, the European Union will attempt to enforce these rules throughout its territory.

In Sweden, the office of Åsa Romson, minister for the environment and co-spokesperson for the Green Party, released a statement saying that a ban on the internal combustion engine is a necessary step to reduce pollution and carbon emissions. In Sweden, only about 3% of electricity production comes from fossil fuels, and plans made by the Persson cabinet in 2005, Making Sweden an Oil-Free Society, already call for a phaseout of the use of oil for heating. The Löfven cabinet has nowhere else to cut in its program to make

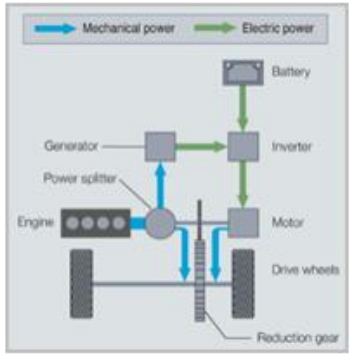

We're proposing in introduce the world's
first **Zero Emission Zone** in Oxford

Technology Overview



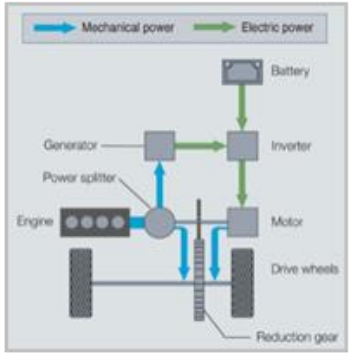
Types of Vehicles

Hybrid



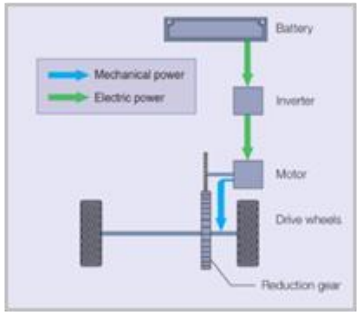
e.g. Toyota Prius

Plug-in Hybrid EV



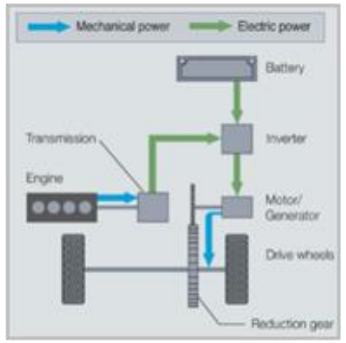
e.g. Toyota Plug-in Prius

Battery EV



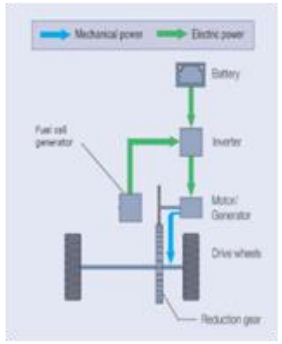
e.g. Nissan Leaf

Range Extended EV



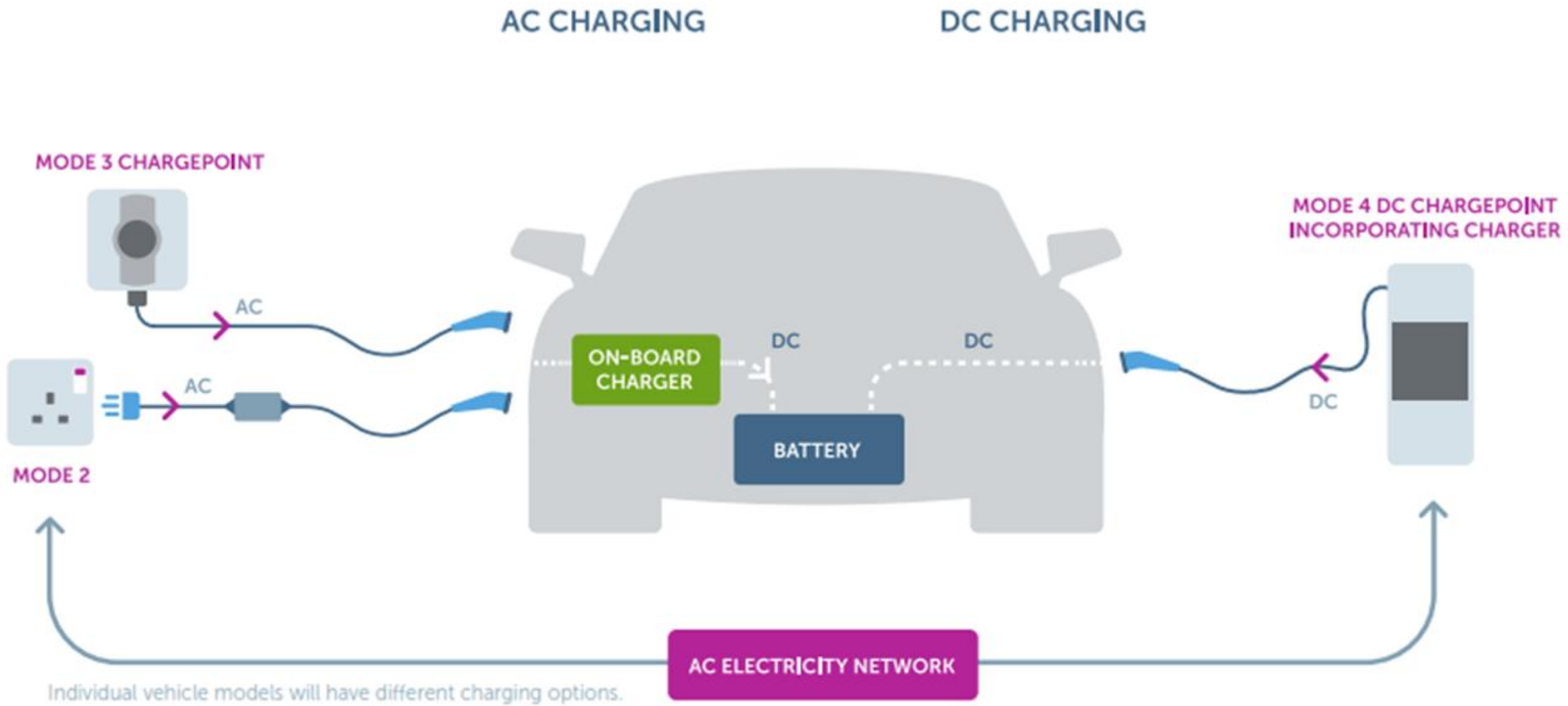
e.g. BMW i3

Hydrogen Fuel Cell



e.g. Hyundai ix35

How do I charge an EV?



How do I charge an EV?

Conductive

Case A

Case C

Case B

Charger Type	Charge Time	Miles per Minute	Power (kW)	Connection Type
Slow	0-100% in 10-12 hours	0.25 miles (@ 3kW)		
Fast	0-100% in 4-6 hours	0.6 miles (@ 7kW)		
Semi-Rapid	0-100% in 1-2 hours	1.9 miles (@ 22kW)		
Rapid	0-80% in 20-30 mins	3.6 miles (@ 43kW)		
Vehicle-to-Grid	0-100% in 6 hours			

Home

Workplace

Long stay car park

Publicly accessible locations

Workplace

Depots

Service station

Tesla Supercharger station

Pre-commercial at Universities

Charge Point Installations

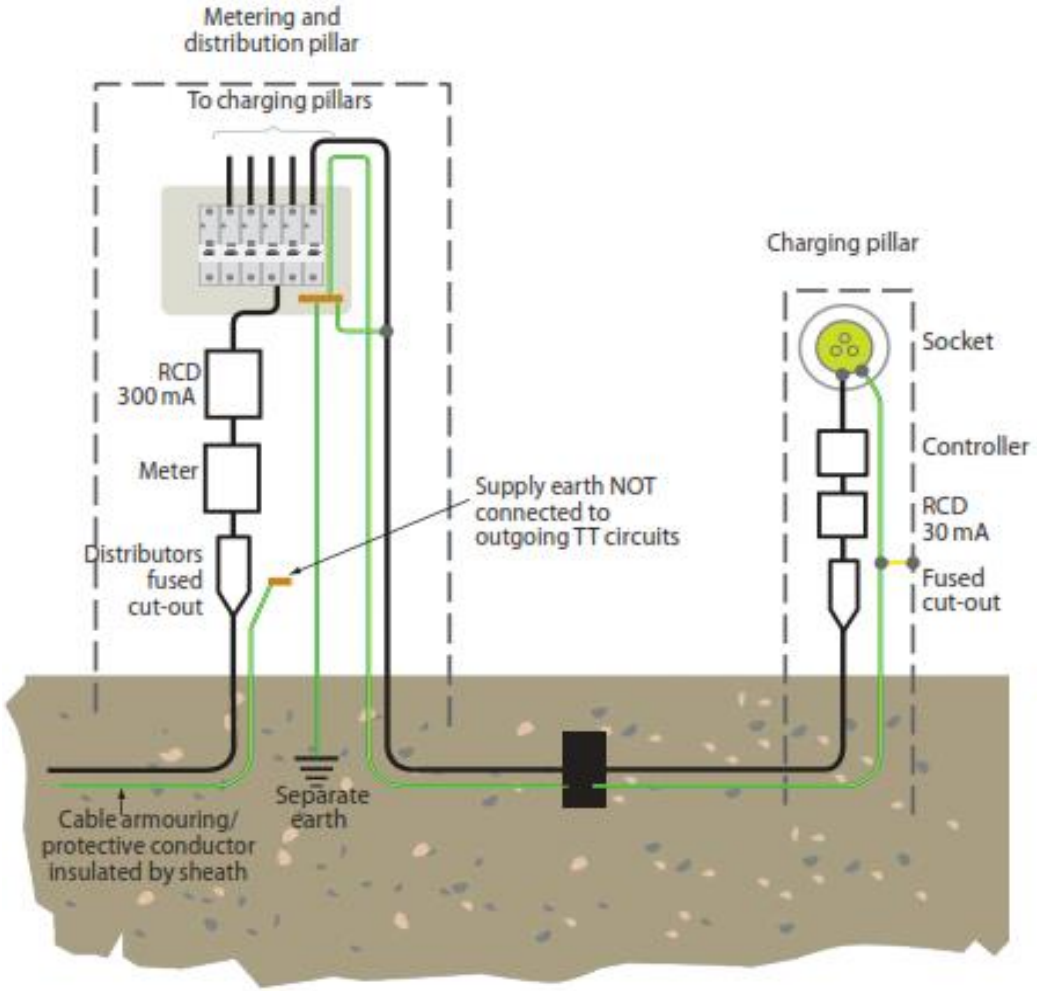
Company branded signage

Fast Charger with Type 2 socket(s)

- Privately owned and monitored site
- Clear bay markings and signage
- Policed by own staff
- RFID card accessed Charge Point (but not always needed)

Charge Point Installations

A typical on-street or car park Fast Charge Point installation



EN62196-2 Type 2

Female socket

Status lights

Feeder Pillar

Display and RFID card reader

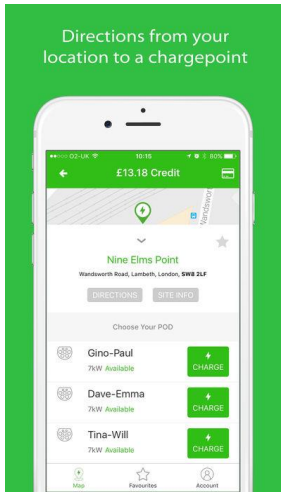
Crash Barrier

Accessing a Charge Point

Key

RFID card

App

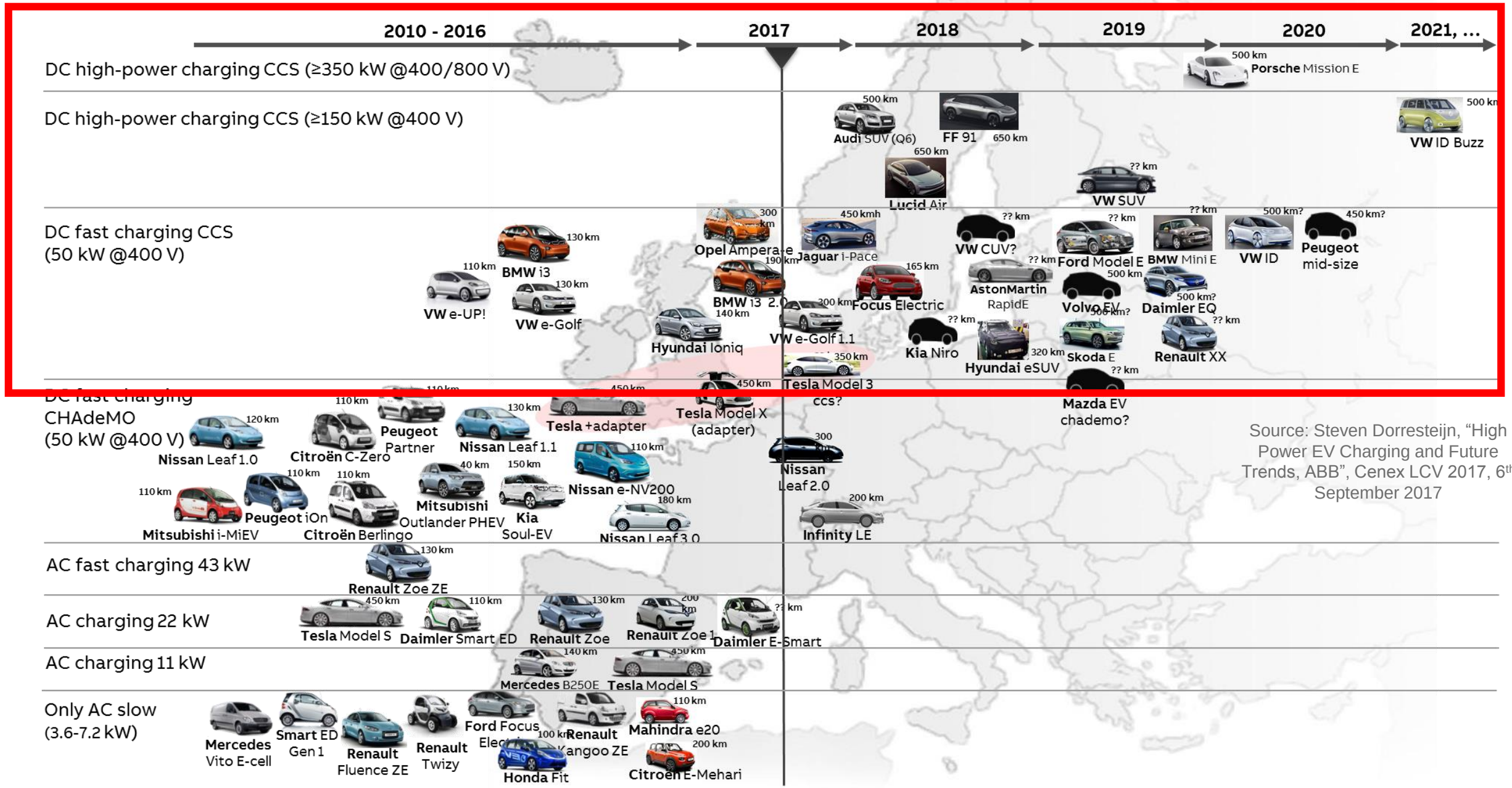


Chip & Pin, Contactless card

Innovation

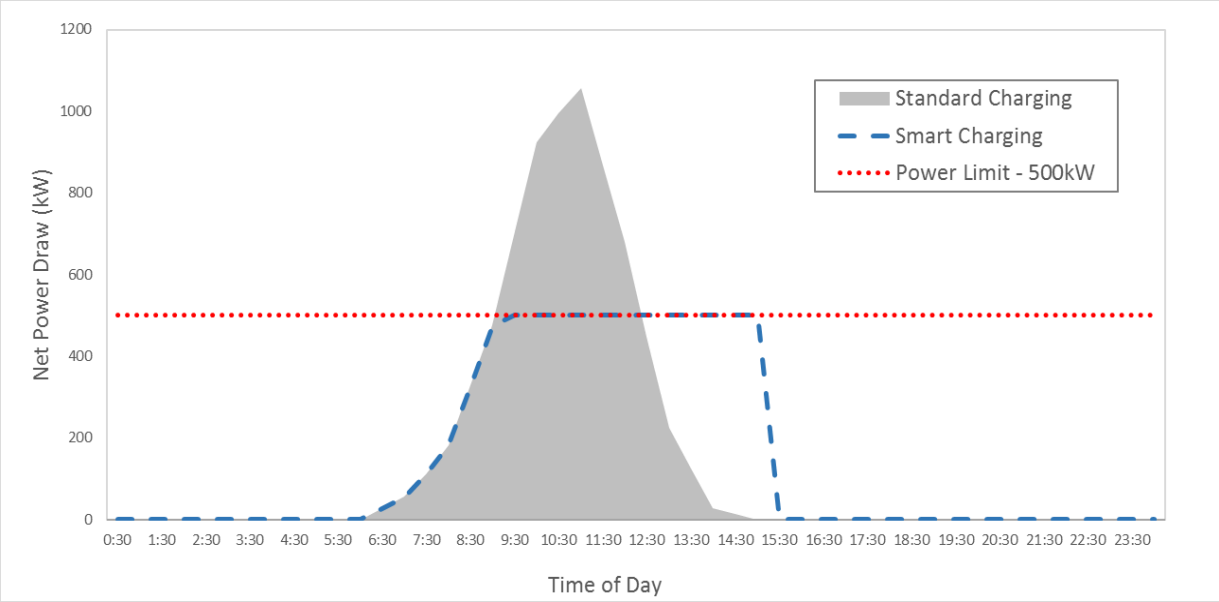

Danger
HIGH
VOLTAGE
efes
For more information, visit www.cenex.co.uk/efes

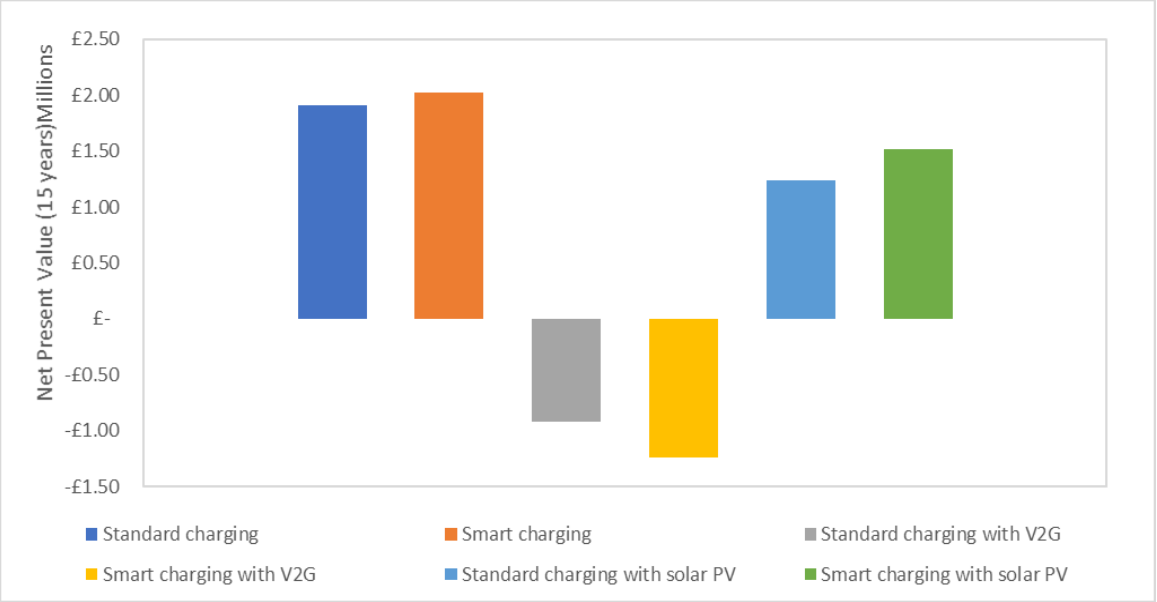
Follow the car through Europe, and open standard protocols



Source: Steven Dorresteijn, “High Power EV Charging and Future Trends, ABB”, Cenex LCV 2017, 6th September 2017

Smart Charging

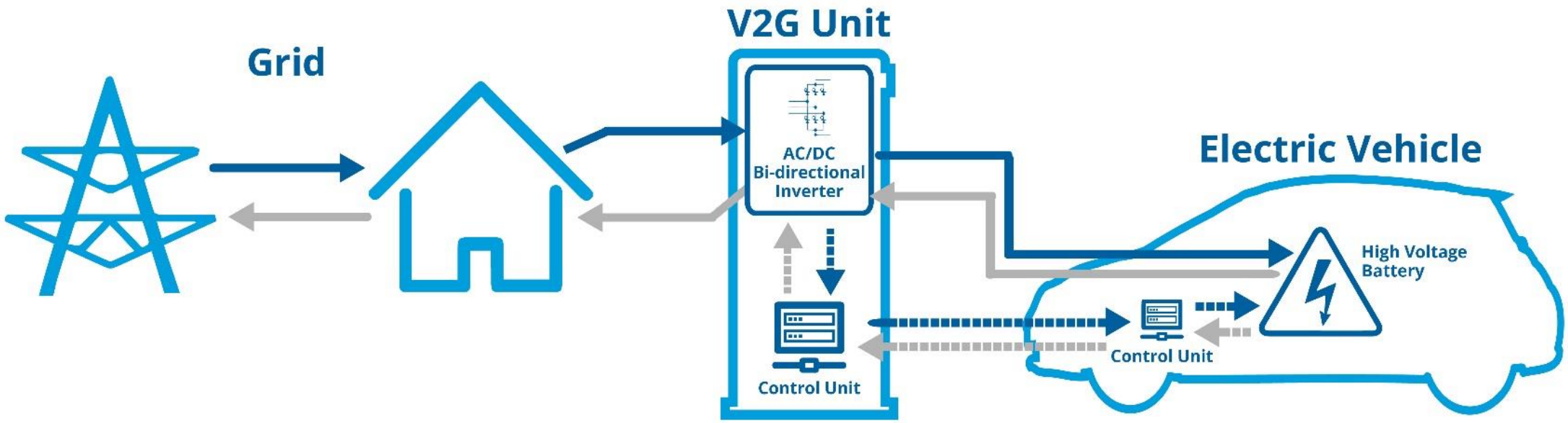




- Smart Charging allows us to better manage the demand

- £812,500 potential savings in infrastructure upgrades from smart charging by 2045.
- 88% EVs projected by 2045, equating to 2750 EVs across all 5 car parks assessed in this analysis example.

Vehicle-to-Grid Systems

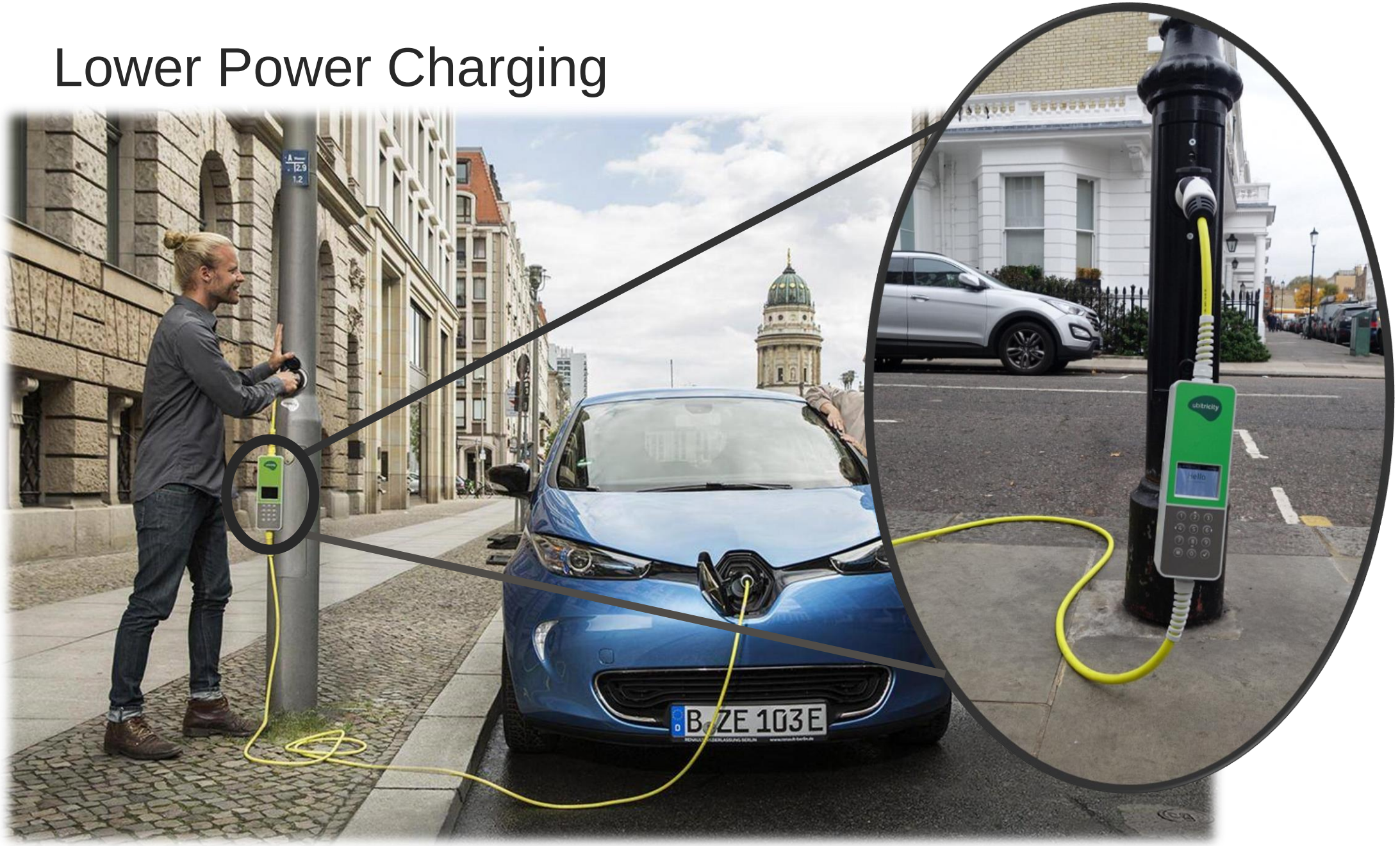


Acts (and looks) very similar to a standard charging point. The difference is that energy flows both to and from the vehicle, turning it into a portable battery store.

Use the EV battery to provide demand shifting and reduce electricity costs.

- Supply energy to energy markets.
- Increase use of localised renewables.

Lower Power Charging



Higher Power Charging

Source: electrek, “The first ‘High-Power fast-charging station’ (150-350kW) is installed by EVgo and ABB right in Tesla’s backyard”, 27 Feb 2017.

“Perfect Procurement”

Installing Charge Points

Considerations prior to the procurement

- Collaborate with other Council departments.
- Site ownership.
- Existing vehicle charging facility.
- Timeline to install charge points.
- Access methods and restrictions.
- Parking space requirement.
- Electricity supply; availability and capacity.
- Traffic Regulation Order alteration requirements and timescales.
- Alternative sites.
- Operational model for the charge points installed.

Project Timescale Allowance

Shortest timescale = a few weeks

Average timescale = 4-6 months

Longest timescale = 3 years

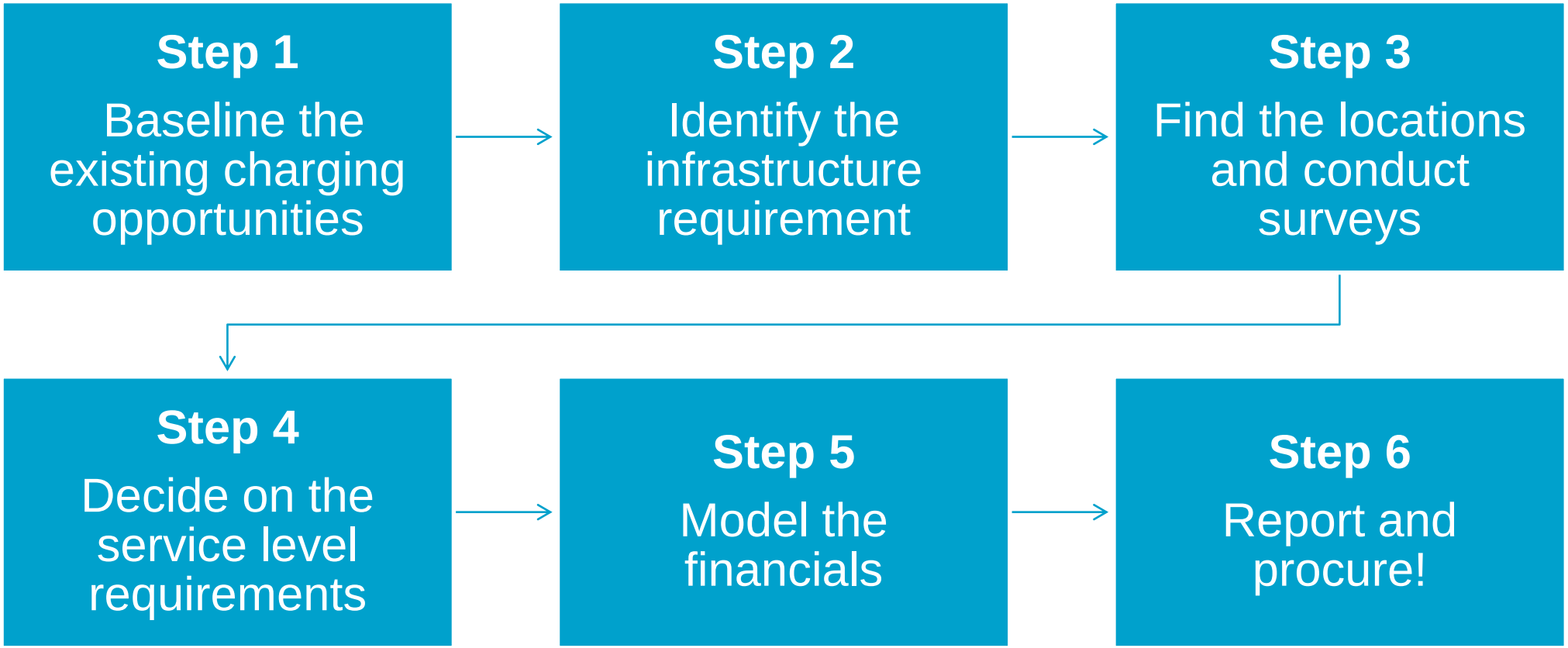
Shortest

- Own site
- Everyone on-board
- Power supply available
- Equipment lead time short

Longest

- Long approval chain
- Landlord needs convincing
- No metered power supply
- Planning permission needed
- TRO needed
- Council procedures too slow
- Long equipment lead time

What does a typical process look like?



Case Study: Shell

Drivers will be able to recharge 80% of their battery in half an hour at forecourts in London, Surrey and Derby.

Branded Shell Recharge, the charging points will cost a discounted 25p per kilowatt hour of power until next June, when the price will revert to its normal level of 49p per kWh.

Ecotricity: £3 Connection Fee, £0.17 per kWh

Nissan Leaf: £9.80

Tesla Model S: £20

Shell: £0.49 per kWh

Nissan Leaf: £19.60

Tesla Model S: £49

Running Networks

Value of the Electricity in the Network

	1	2	3	1	2	3
	FY 2017 / 18	**FY 2018 / 19**	**FY 2019 / 20**	**FY 2017 / 18**	**FY 2018 / 19**	**FY 2019 / 20**
Fast 7 kW	2	2	2	0	0	0
Fast 22 kW	6	6	6	10	24	28
Rapid 50 kW	4	4	4	9	21	34
Estimated Network Utilisation	8%	10%	15%	15%	25%	40%
Estimated Electricity Cost	£ 10,078.04	£ 13,134.93	£ 20,449.89	£ 36,054.32	£ 147,767.99	£ 357,175.40
Estimated Maintenance Cost	£ 6,000.00	£ 6,000.00	£ 6,000.00	£ 9,500.00	£ 22,500.00	£ 31,000.00
Estimated Electricity & Maintenance Cost	£ 16,078.04	£ 19,134.93	£ 26,449.89	£ 45,554.32	£ 170,267.99	£ 388,175.40
Total 3 Year Cost			£ 61,662.86			£ 603,997.70

Where do we go next?

- Change is happening everywhere; so much so that we have to ask is it **socially acceptable** for local authorities to not be investing in low emission vehicles and technology?
- **Air quality issues** are understood by consumers (is CO2?)
- Will the implementation of **Clean Air Zones** transform local business? How can we manage with last-mile delivery models?
- Technology is developing, and battery sizes are increasing, so how can we **future proof** our procurement decisions?
- Procurement processes are very **strategic**, and can quickly go wrong!

Thank you for listening

Are there any questions?

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