The present and future for electric vehicles. Are you ready?

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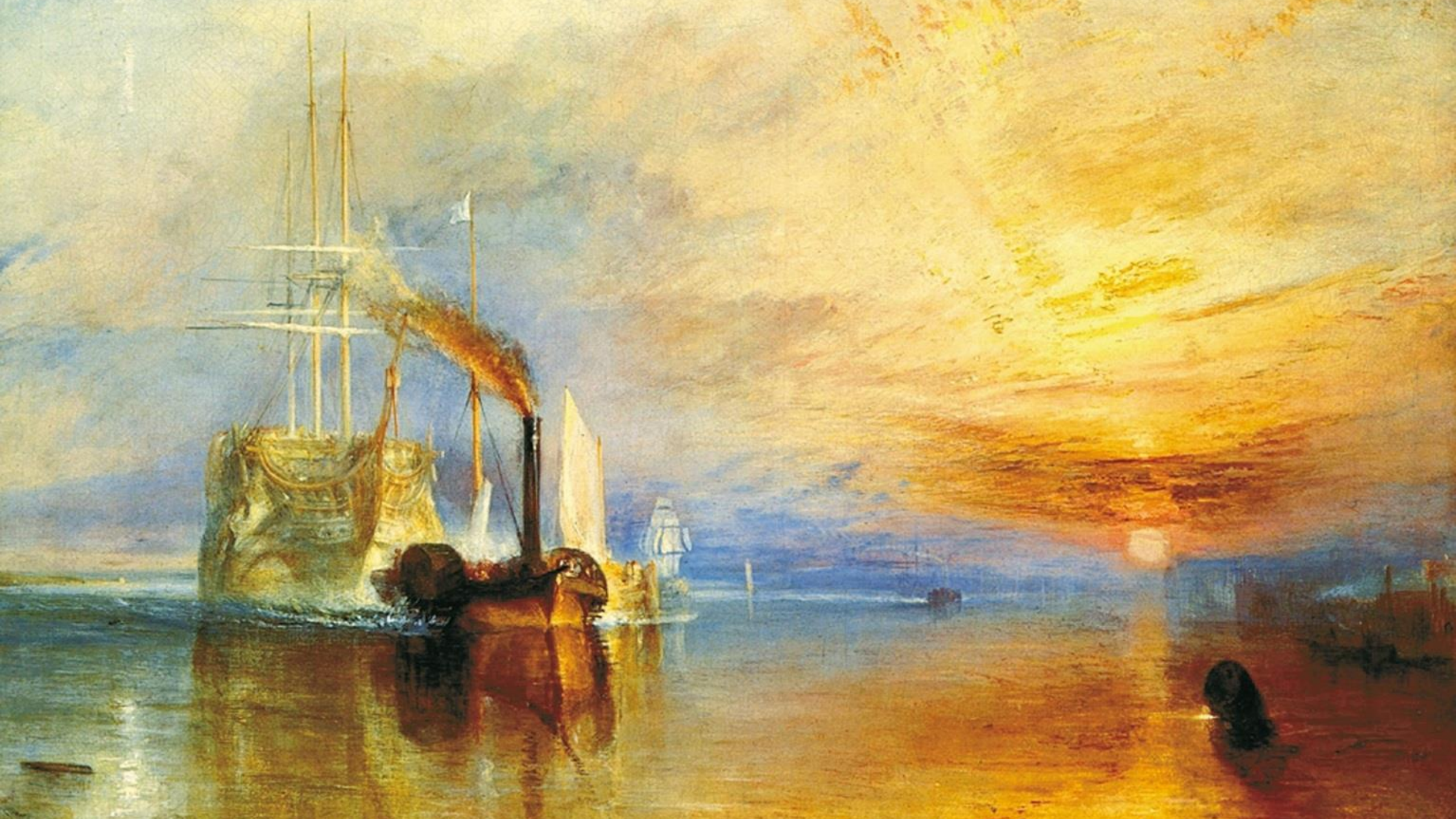
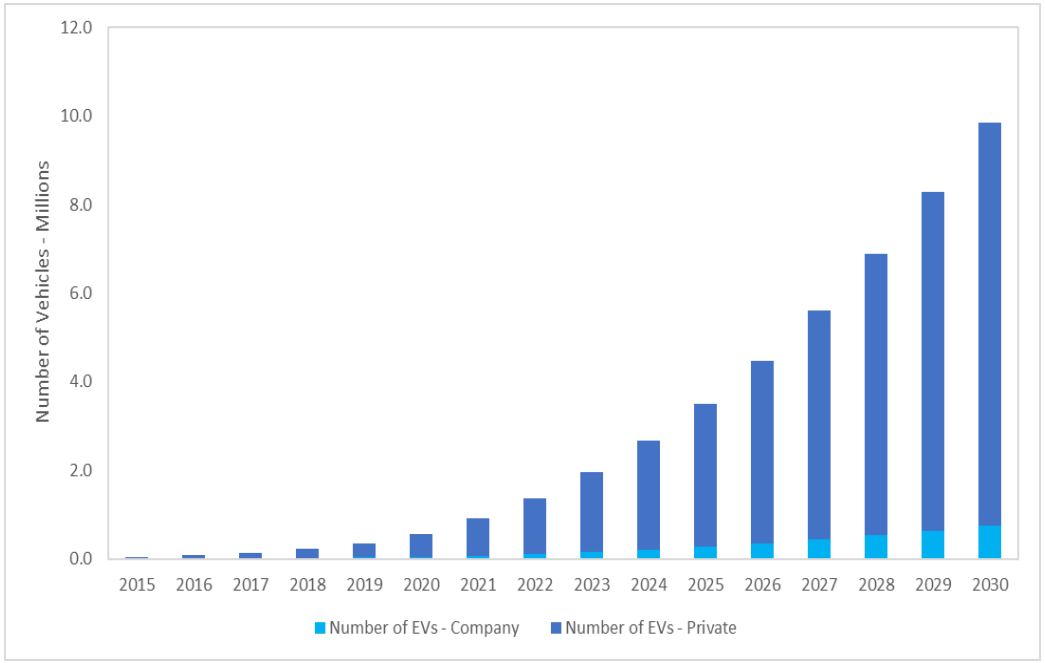
Independent, not for profit, low carbon technology experts

Cenex, Centre of Excellence for Low Carbon and Fuel Cell Technologies

- Independent, not for profit, low carbon vehicle experts
- Established with support from UK Government and Automotive Industry
- 10 years experience in UK and EU collaborate research projects
- Experience in Electric, Gas, Biomethane and Hydrogen vehicles
- Expertise in vehicle trials and demonstrators using real world data for carbon and cost analysis
- Three years V2G experience
- Low carbon vehicle fuelling and charging infrastructure expertise
- Manage Europe's premier Low Carbon Vehicle Technology event – LCV www.cenex-LCV.co.uk



50% of all new cars sold in UK by 2025 will be electric



Committee on Climate Change 5th budget

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

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."

All Volvo cars to be electric or hybrid from 2019

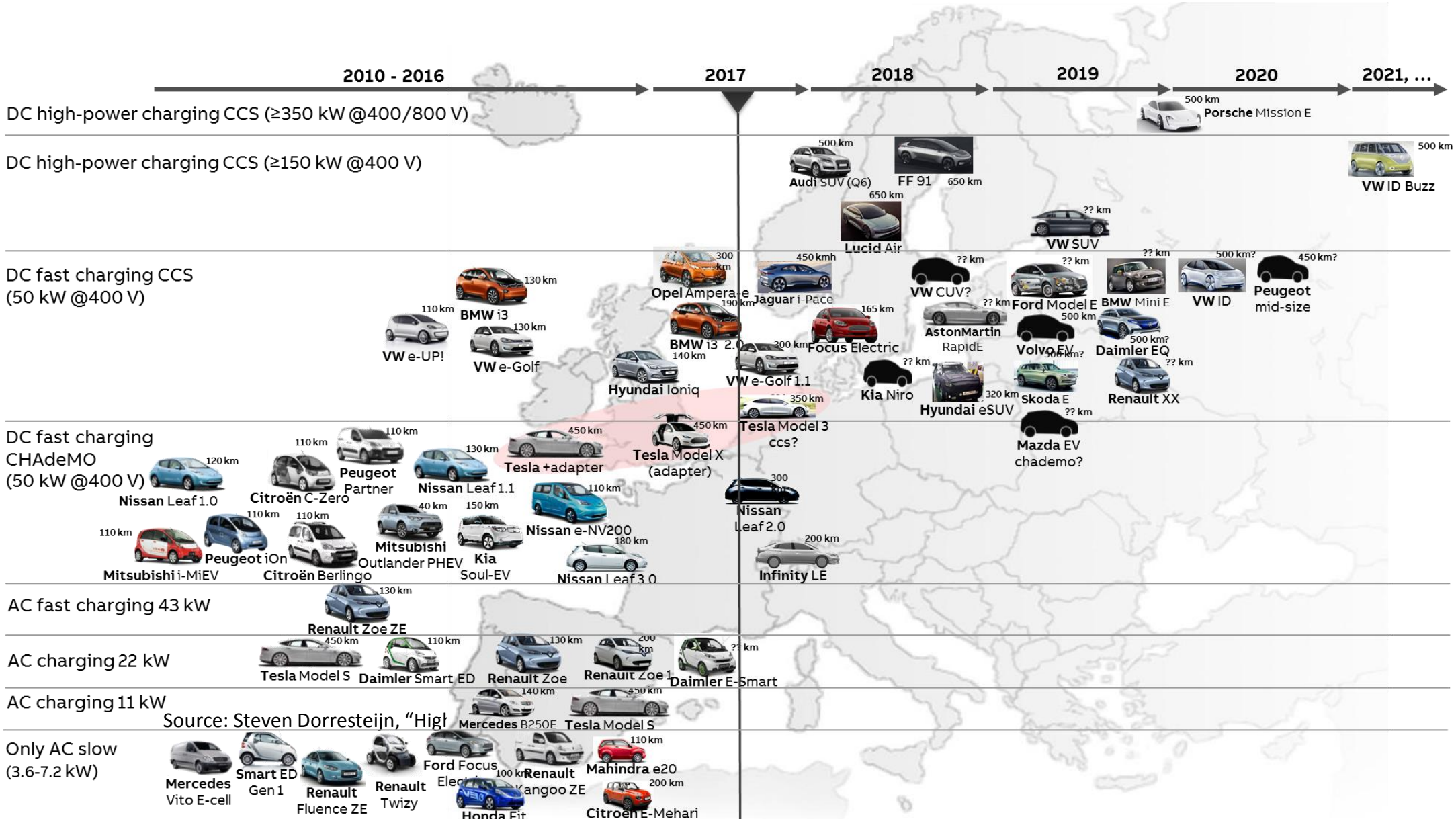
Landmark move as first big manufacturer says it will stop making vehicles solely powered by internal combustion engine

News › Business › Business News

Shell launches fast-charging stations for electric vehicles

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

Bigger batteries and Higher Power Charging



Source: Steven Dorresteijn, "High

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.

Electric Shared mobility – Autolib, Ecar club, Drive Now

apse energy Stuttgart: Integrated booking, payment and route planning

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STUTTGART SERVICES

livinglab BW e mobil
Unterstützt durch das Land Baden-Württemberg

schaufenster elektromobilität
Eine Initiative der Bundesregierung

Modern Mobility for the Region Stuttgart via Integration of Services

- Integrated Mobility Card (and App) to get easy access to different, multi modal offers for green transport, e.g. (local) public transport, eCar-to-Go, eBike-to-Go, etc.
- approx. 500,000 subscribers of local public transport.
- Extension to cash and bonus cards for retail and municipal services (e.g. museums)

EnBW · highQ · Fraunhofer · BOSCH · EOS UPTRADE · BW Bank · SCHEIDT&BACHMANN · MRK · mdv · CAR2GO · DB · vvs · SSB · universität ulm · STUTTGART · e-mobil BW · Region Stuttgart

Nottingham: Integrated payment

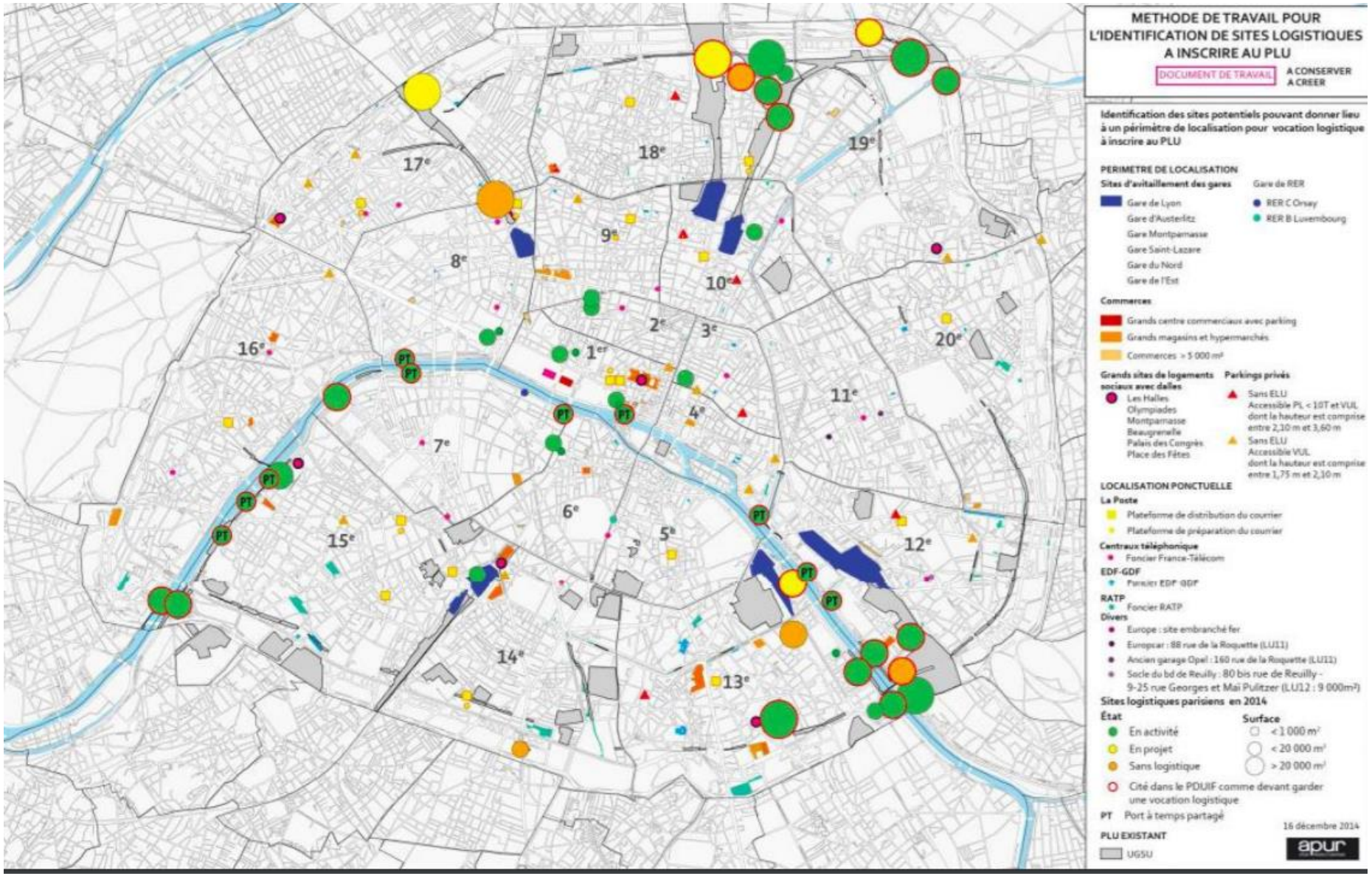
Robin Hood - Integrated multi model E-mobility and Green Energy

ROBIN HOOD
PAY AS YOU GO TRAVEL

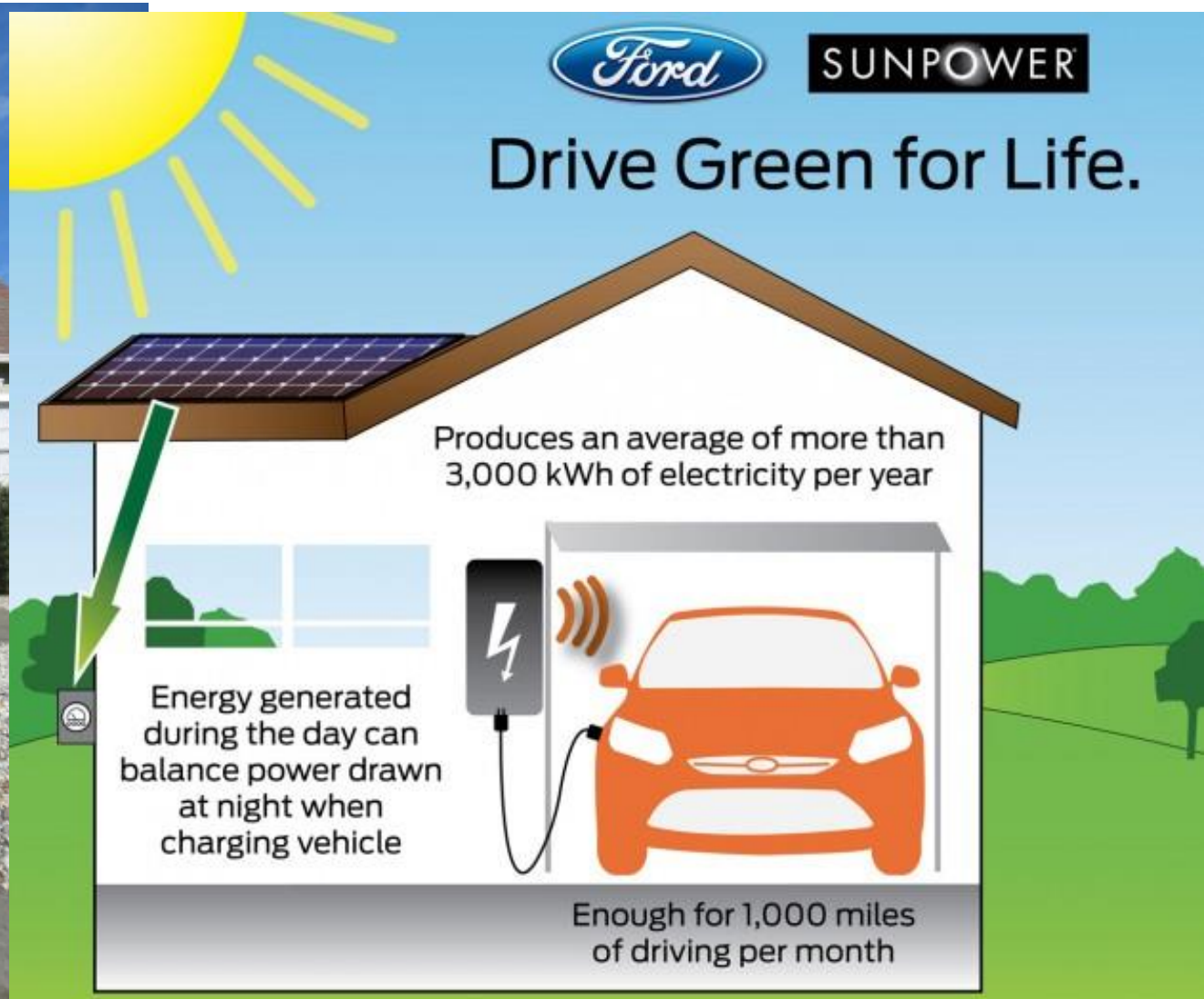
RobinHoodenergy
A not for profit company

Innovation in city freight deliveries

Paris: Freight consolidation plan – last mile in electric



USA: Electric cars and renewables



EV CHARGING STATION

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PV, demand management and Vehicle 2 Grid

INDEPENDENT

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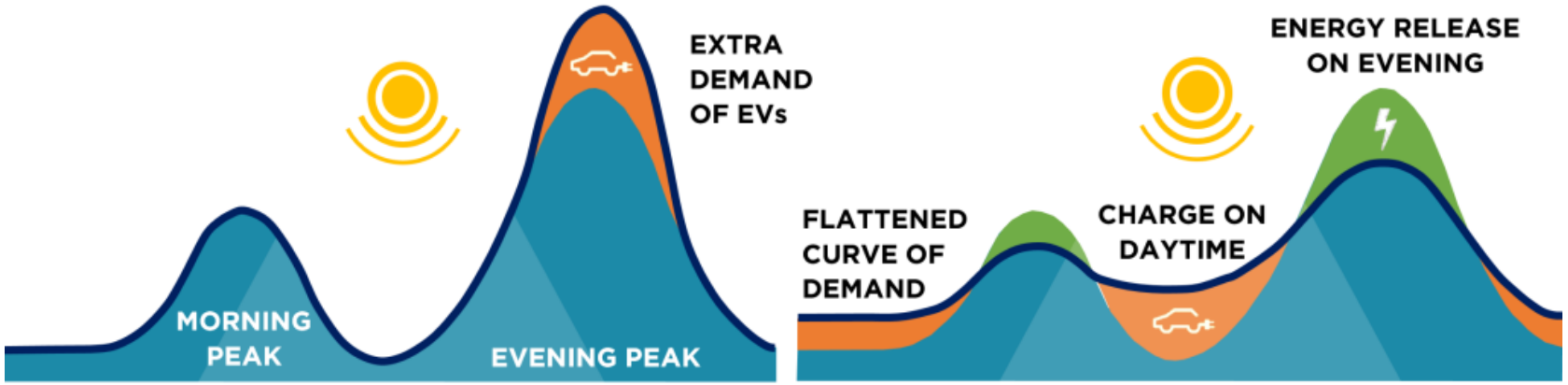
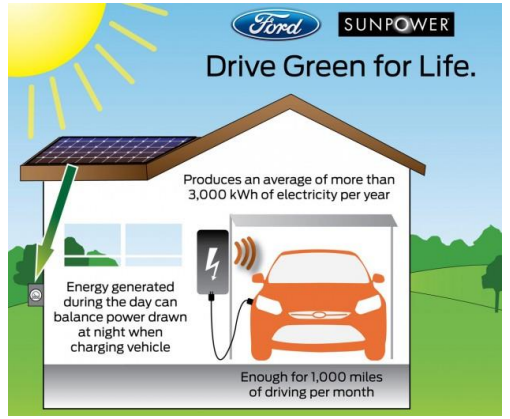
UK drivers could get paid for owning an electric car under new plans from Nissan and Ovo Energy

Owners of Nissan's electric cars will be able to connect their batteries to the grid during low-demand, cheap tariff periods and sell it back at a profit during expensive times



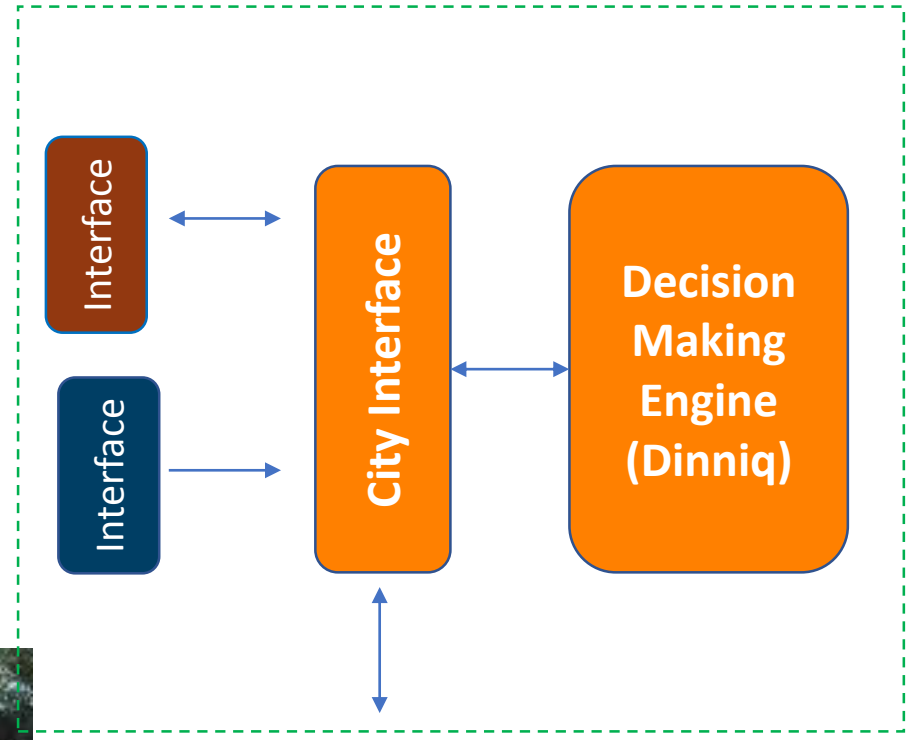
WITHOUT V2G

WITH V2G



Geo fenced range extended electric delivery vehicle

- Project provides the ‘missing link’ connecting vehicles to city infrastructure
- Decision Making Engine is able to monitor, manage and control the zero emission operation of plug-in hybrid and range-extended hybrid vehicles within a the city ensuring zero emissions driving in areas of poor air quality



Autonomous Vehicles - Target Areas for Adoption

Conventional Vehicles

New Mobility Concepts

Driverless Logistics

+ military + industrial workhorses

UK: Autonomous Pods

Lutz Pathfinder

The Low-carbon Urban Transport Zone (LUTZ) Pathfinder autonomous electric vehicle has 22 sensors in total including panoramic cameras, laser imaging, and radar, which it uses to build very detailed virtual (3D) maps of the world around it.

Westfield Electric Pod

The Westfield Electric Pod demonstrated in 2 flagship projects; the Venturer project in Bristol and the GATEway project in London.

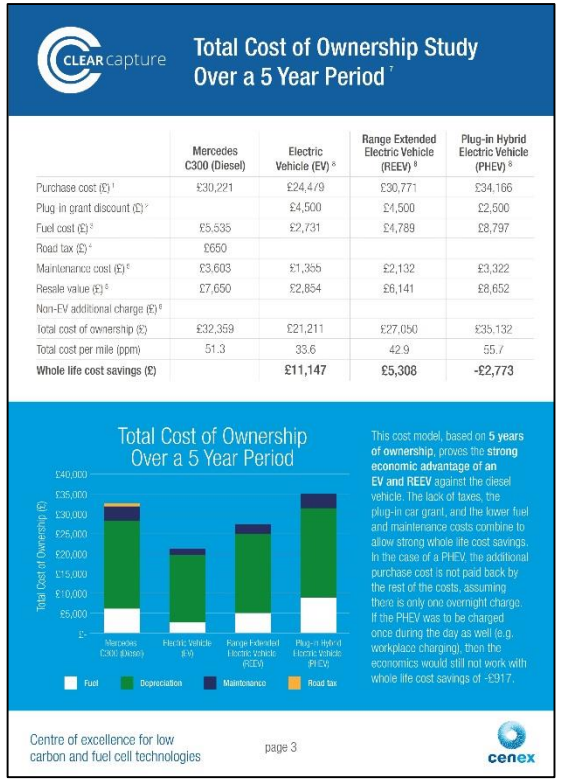
Low cost data for better decision making

Purpose: “CLEAR Capture” stands for Cost-effective Low Emissions Analysis from Real-world Data Capture. This analysis is more accurate as it directly uses your real-world operational data, not estimates of performance, to calculate your whole life costs, operational performance and carbon savings comparisons of switching from a conventional vehicle to an ultra-low emission vehicle (ULEV).

This analysis includes:

- Plug-in device deployment
- Data collection
- Data analysis
- Analysis reporting
- 30 minute explanation call

What will I know? You will fully understand if there is an economic (total cost of ownership) or environmental business case (savings of NOx and CO2) to swap your conventional vehicles to a low emission vehicle, and know the technology types that offer the best savings in your bespoke fleet operational profile.



CLEAR capture

Total Cost of Ownership Study Over a 5 Year Period [7]

	Mercedes C300 (Diesel)	Electric Vehicle (EV) [5]	Range Extended Electric Vehicle (REEV) [5]	Plug-in Hybrid Electric Vehicle (PHEV) [5]
Purchase cost (£) [1]	£30,221	£24,469	£30,771	£34,166
Plug in grant discount (£) [2]		£4,500	£4,500	£2,500
Fuel cost (£) [3]	£5,535	£2,731	£4,789	£8,797
Road tax (£) [4]	£650			
Maintenance cost (£) [5]	£3,603	£1,355	£2,132	£3,322
Resale value (£) [6]	£7,650	£2,854	£6,141	£8,652
Non-EV additional charge (£) [6]				
Total cost of ownership (£)	£32,359	£21,211	£27,050	£35,132
Total cost per mile (ppm)	51.3	33.6	42.9	55.7
Whole life cost savings (£)		**£11,147**	**£5,308**	**-£2,773**

Total Cost of Ownership Over a 5 Year Period

This cost model, based on **5 years of ownership**, proves the **strong economic advantage of an EV and REEV** against the diesel vehicle. The lack of taxes, the plug-in car grant, and the lower fuel and maintenance costs combine to allow strong whole life cost savings. In the case of a PHEV, the additional purchase cost is not paid back by the rest of the costs, assuming there is only one overnight charge. If the PHEV was to be charged once during the day as well (e.g. workplace charging), then the economics would still not work with whole life cost savings of -£917.

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Charging infrastructure - Locations

	Fast chargers	Rapid chargers
Number of chargers	135	95