Implications and opportunities for Centrica from the evolving market for low carbon vehicles

Presentation to Centrica

Windsor

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Greg Archer

Managing Director, Low Carbon Vehicle Partnership

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Low Carbon Vehicle Partnership

Accelerating a sustainable shift to low carbon vehicles and fuels in the UK –

stimulating opportunities for UK businesses

Outline

- The evolving market for vehicles and fuels
- Electrification of transport
  - Vehicles
  - Market acceptability
  - Recharging
  - Grid impacts
  - Business models
- Biomethane in transport
- Conclusions

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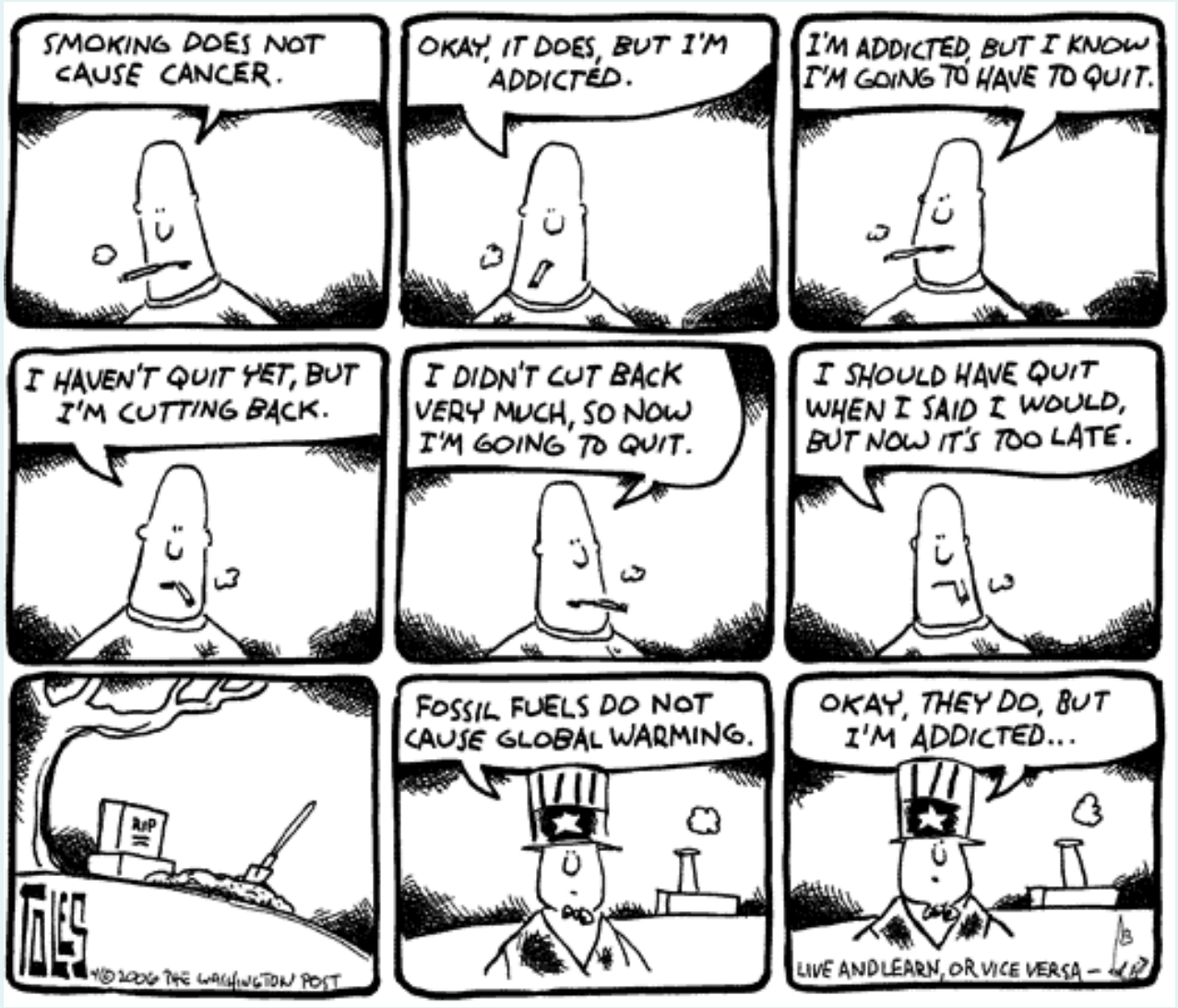
Petroleum accounts for 99% of transport fuel use with widely recognised risks and implications

- Climate Change
- Peak Oil
- Security of supply



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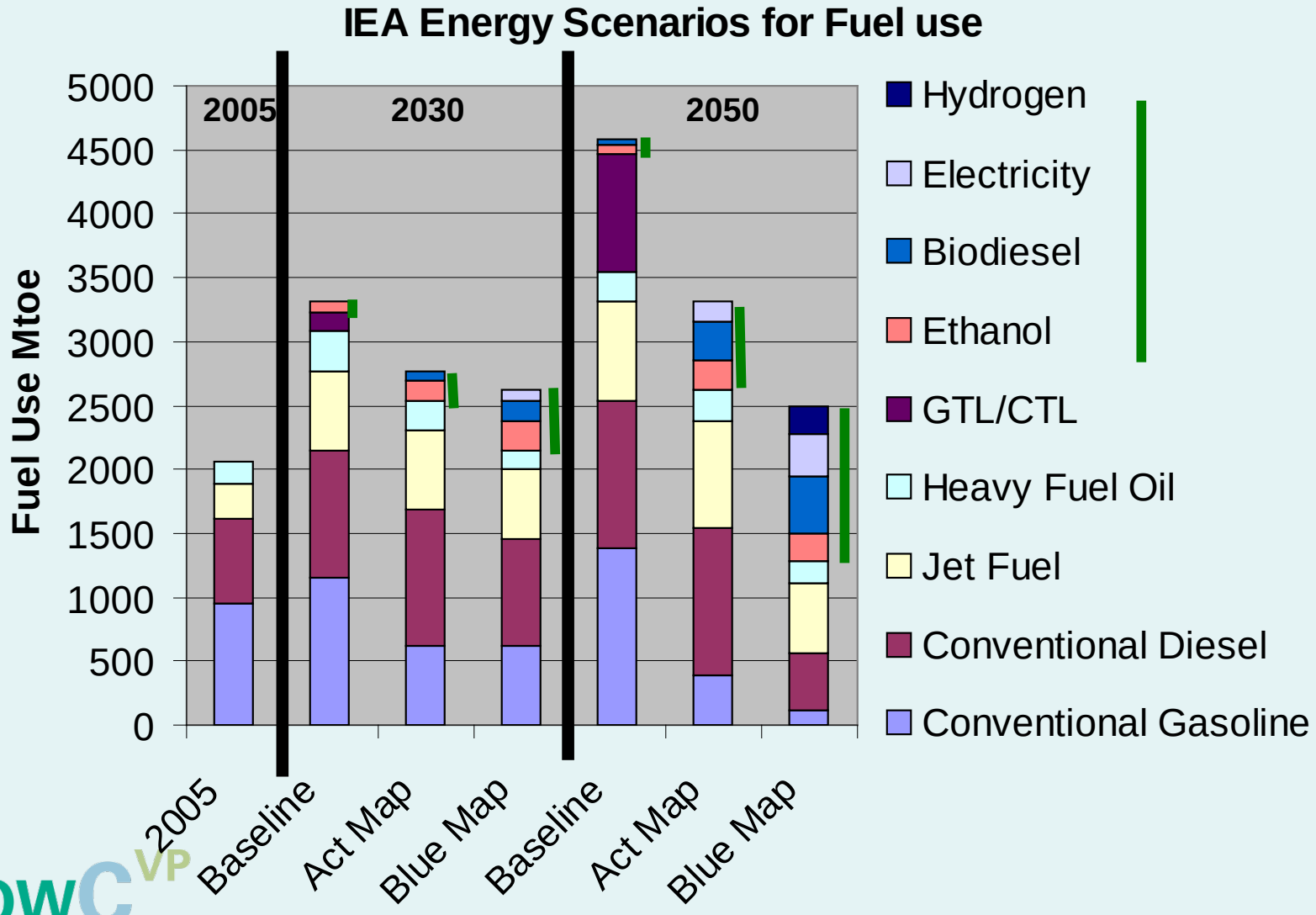
IEA scenarios show an increasing penetration of renewable transport fuels to meet increasing demand



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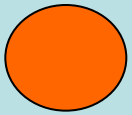
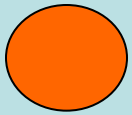
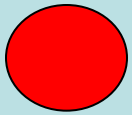
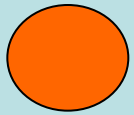
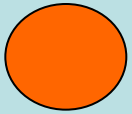
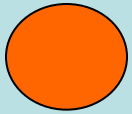
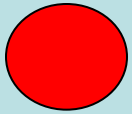
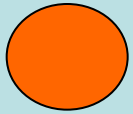
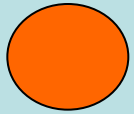
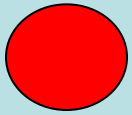
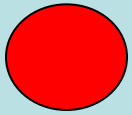
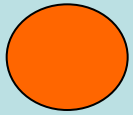
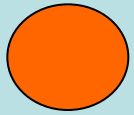
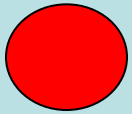
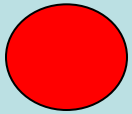
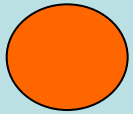
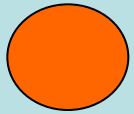
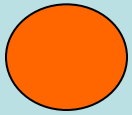
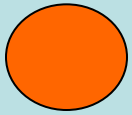
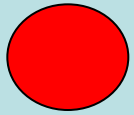
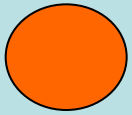
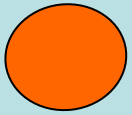
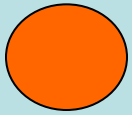
IEA 2008, Energy Technology Perspectives

There remain challenges with all current renewable transport fuels

	Current Biofuel	Adv. Biofuel	H2-IC	H2-FCV	Bio-CH4	EV
Technology readiness						
Cost competitiveness						
Vehicle availability						
Infrastructure deployment						
Driver acceptability						
Sustainability						

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The relative scores do not represent LowCVP policy

There is global momentum towards electrification of transport

- EVs address key geopolitical concerns:
  - Climate
  - Energy security
  - Peak oil
- Early consumer interest as sustainable, cool, high technology products
- Substantial public funding of research, development and demonstration and purchase support
- Investment & commitment from global OEMs

But ...early visionary vehicles do not create a mass market

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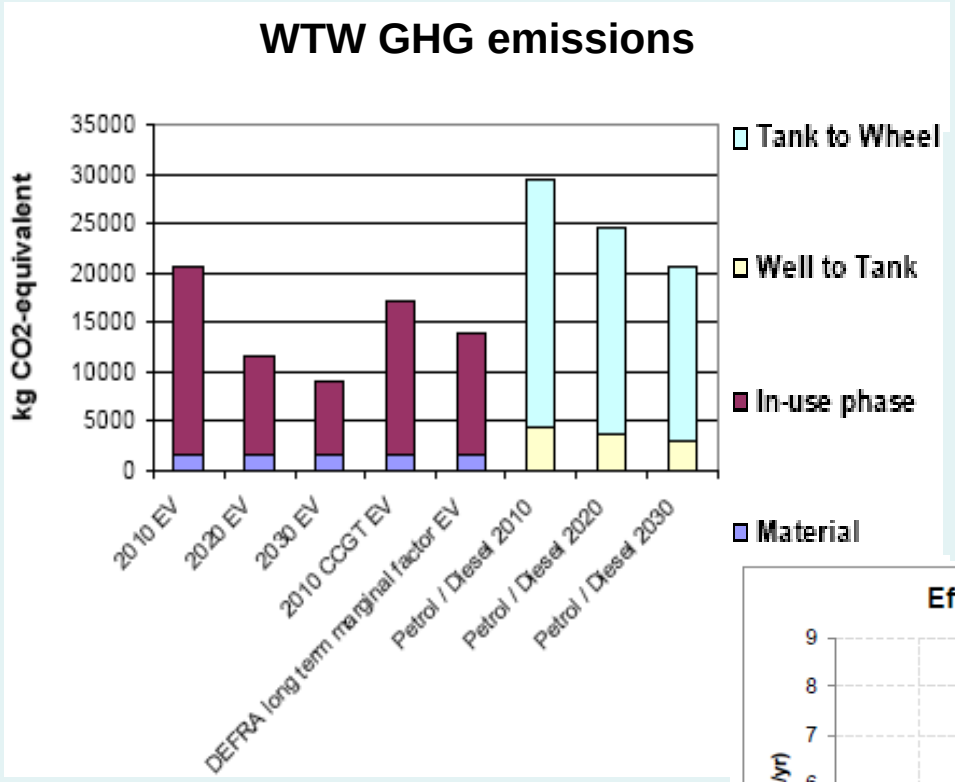
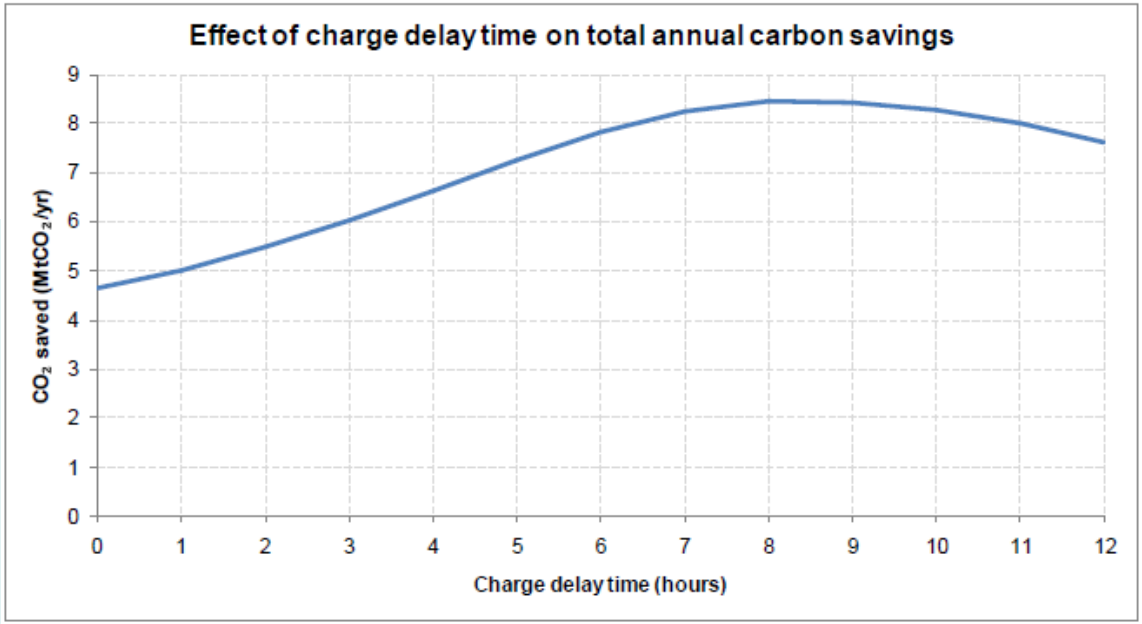
EVs deliver a third lower CO2 emissions using current UK grid-mix – off-peak recharging increases the benefit by approaching 50%



Cenex / Arup 2008

Element Energy 2009



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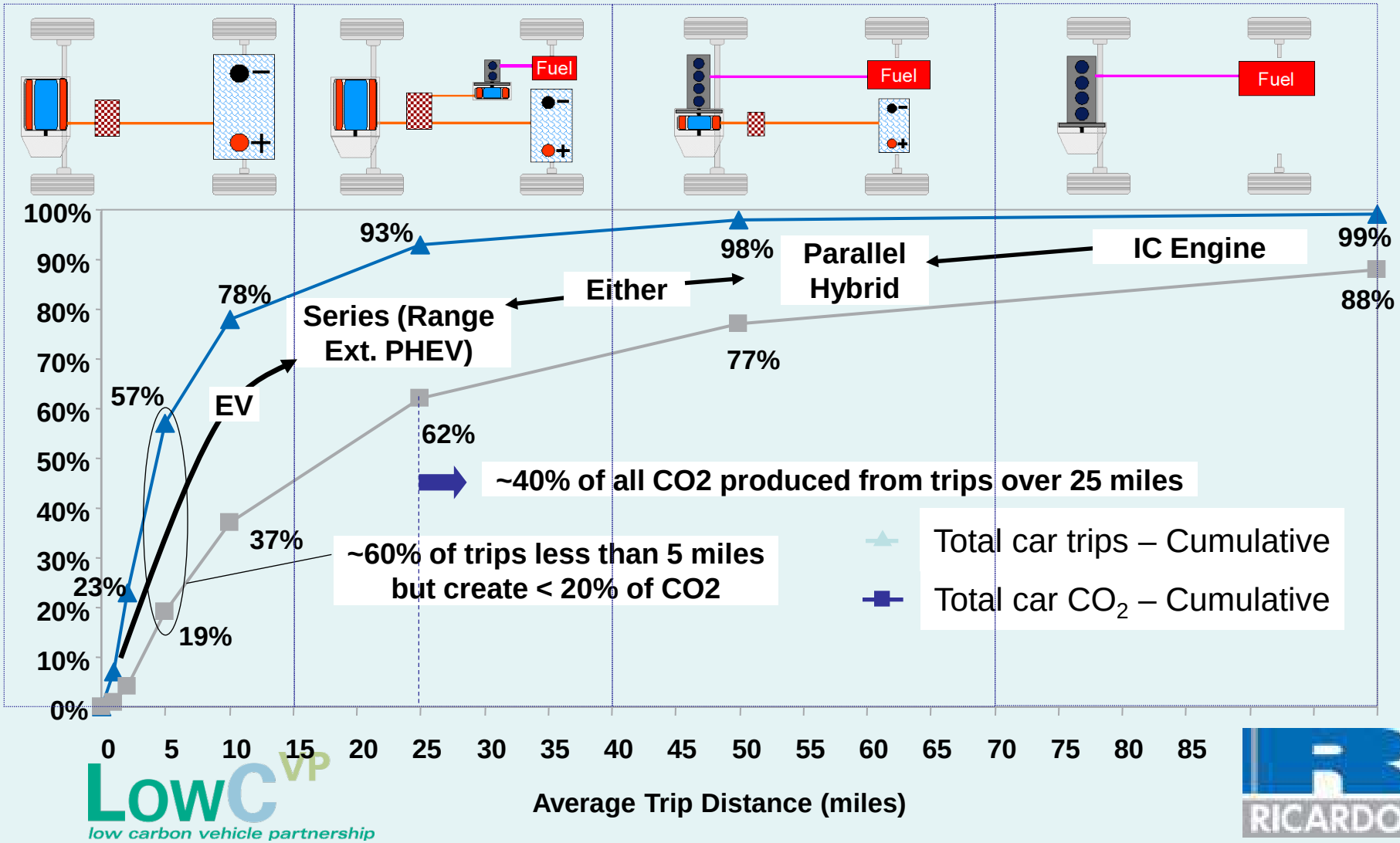
Technology will be tailored to the application - EV for city use, PHEV or parallel hybrid for medium length journeys; IC for long journeys



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RICARDO

A range of EVs from global manufacturers will become available from 2010 – most based upon current car platforms

Toyota FT EVII - 2012

Toyota Prius PHEV - 2011

Nissan Leaf – 2010 (not EU)

Mitsubishi MiEV – 2010
Citroen Evie – 2011

Renault Fluence – 2011
(not EU) + others

Vauxhall Ampera - 2011

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Electric vehicles will only appeal to most car-buyers with significant incentives

EV users are educated, relatively affluent, multi-car households with off-road parking

- High capital costs – key purchase determinant
  - Leasing options likely
- Fuel-cost savings heavily discounted
- Requirement for very high range
- Range anxiety reduces usage to 33-50% of technical range
  - Fast charging / battery swap builds confidence
- Low willingness to pay – beyond early adopters
- Limited availability of recharging infrastructure
- New technology aversion

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Price is the most important limitation for current and prospective EV users followed by range and access to recharging

	High Price	Limited Range	Time to charge	Inconvenience of recharging	No recharging points	Lack of power or performance	Unfamiliarity	Lack of choice
Household EV owners	+++	++	+	+	++	+	+	++
Household EV considerers	+++	++	+	+	++	+	+	++
Commercial EV owners	+++	+++	+++	++	+++	++	+	+++
Commercial EV considerers	+++	++	+	+	++	+		+

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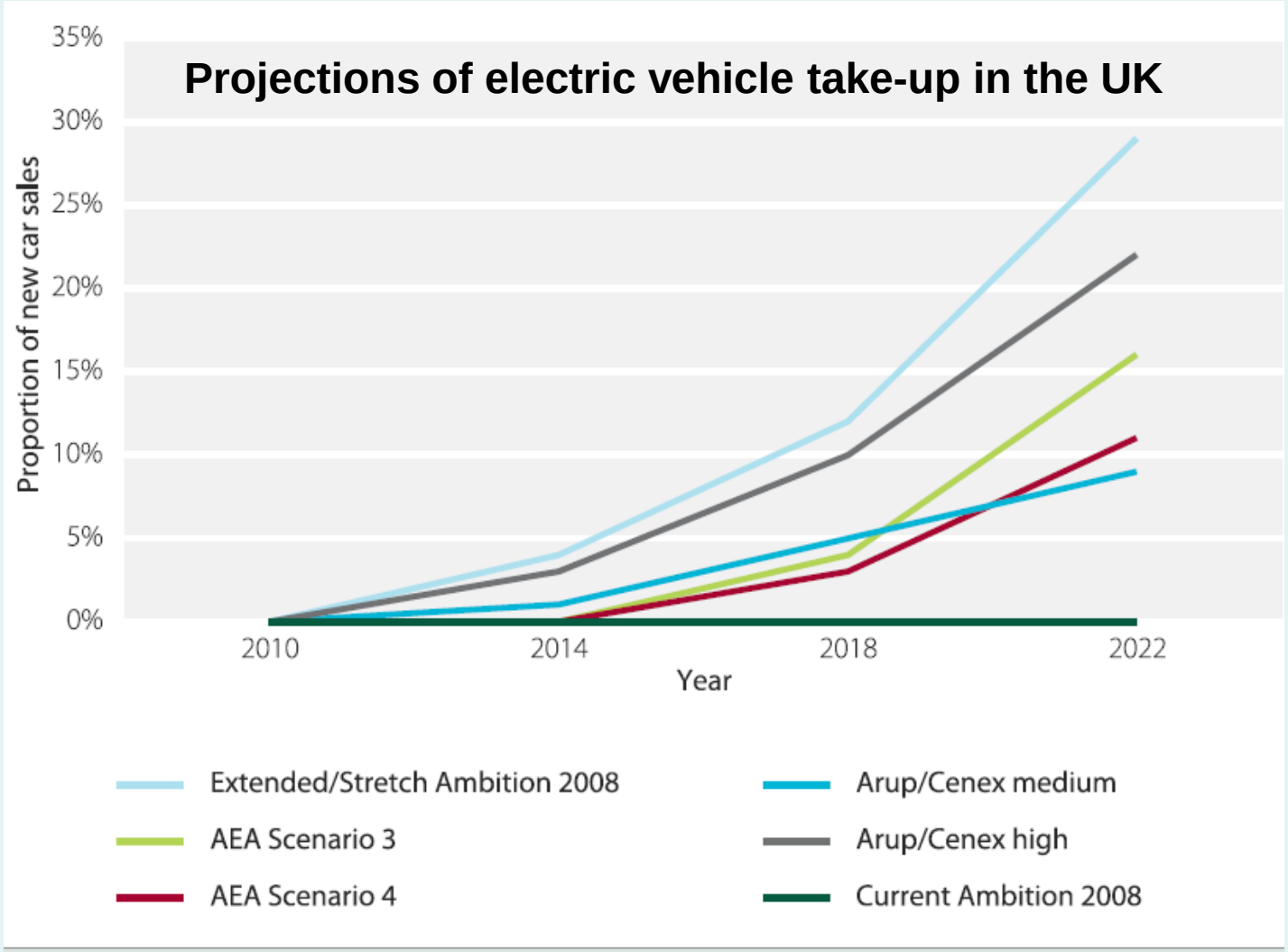
Element Energy, 2009

Market uptake is highly uncertain – depending upon public acceptability, battery costs / subsidies



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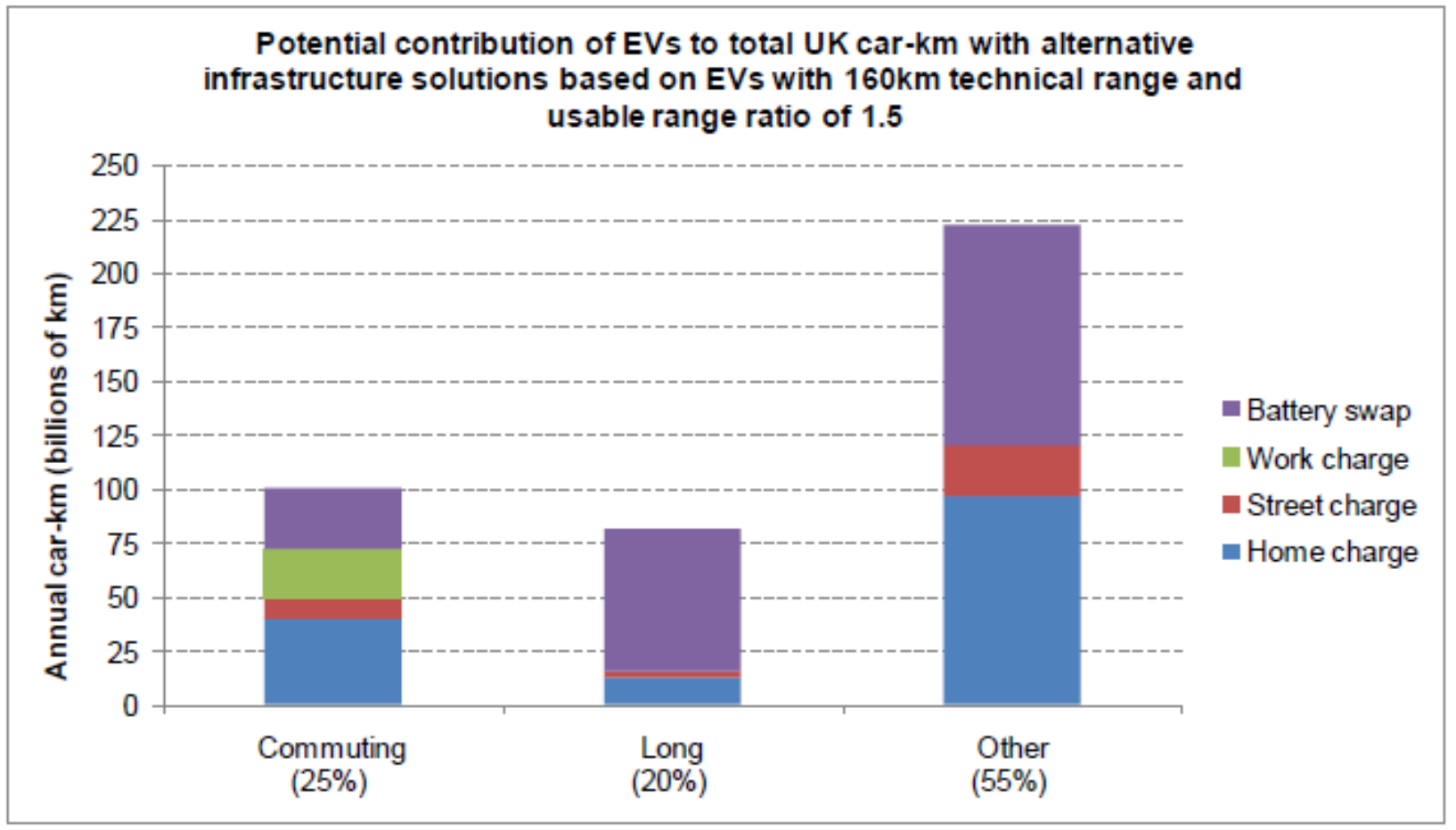
Climate Change Committee 2009

Visible on-street charging may be important to increase public acceptability without being technically important



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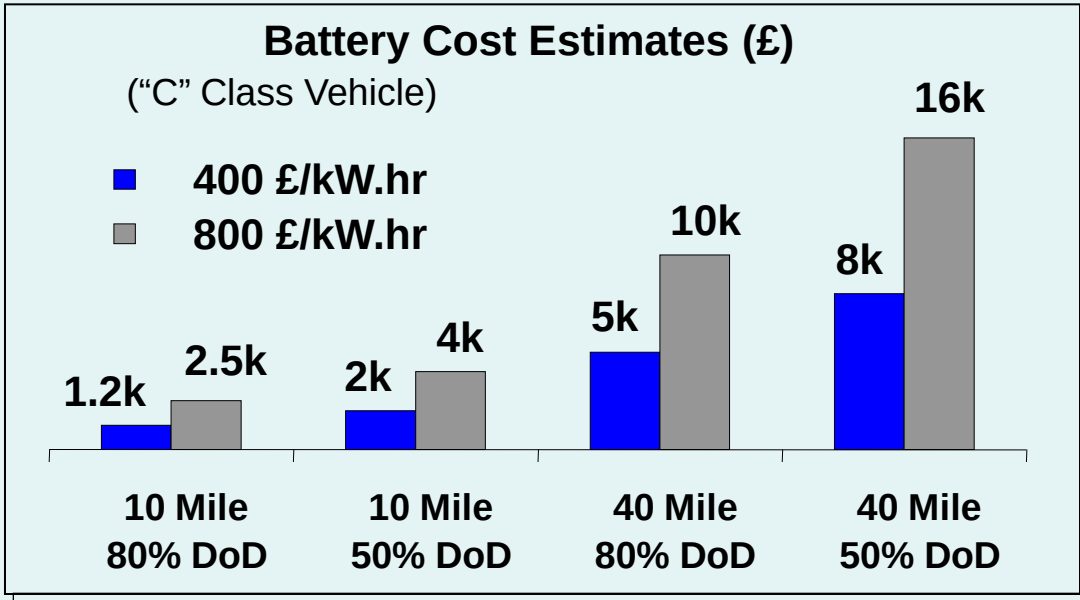
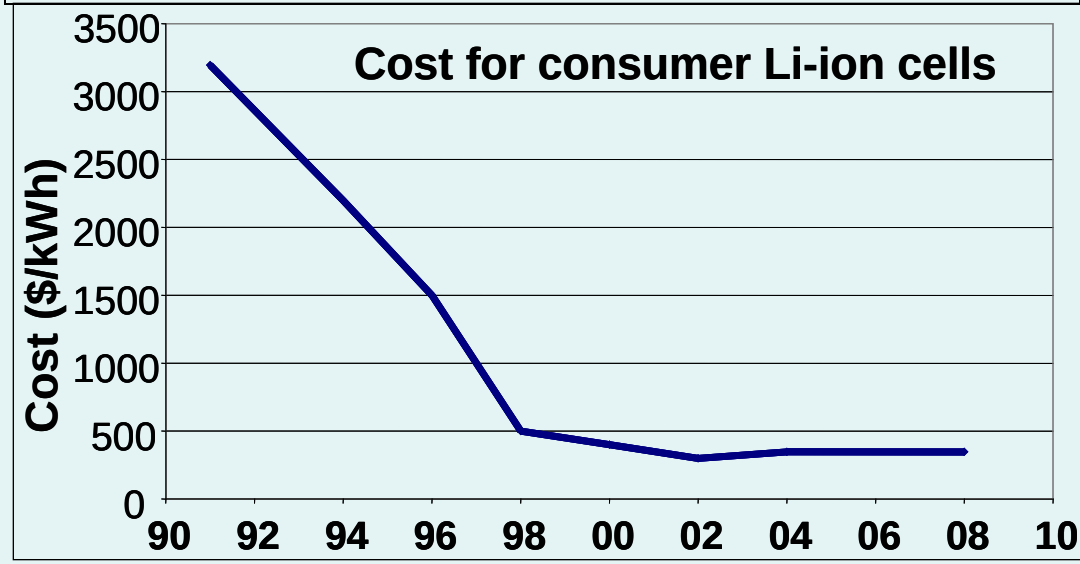
Element Energy, 2009

There are complex interactions between vehicle range & battery depth of discharge, lifetime & cost

- Li-ion currently c$1600/kwh
- **Outlook** battery price for automotive applications c$1000/kwh
- Cost must be reduced to c$400/kwh for EV city cars to be competitive
- PHEV applications more likely outside city applications
- Cell price stable - high cost of raw materials

- Technology breakthrough necessary for widespread adoption





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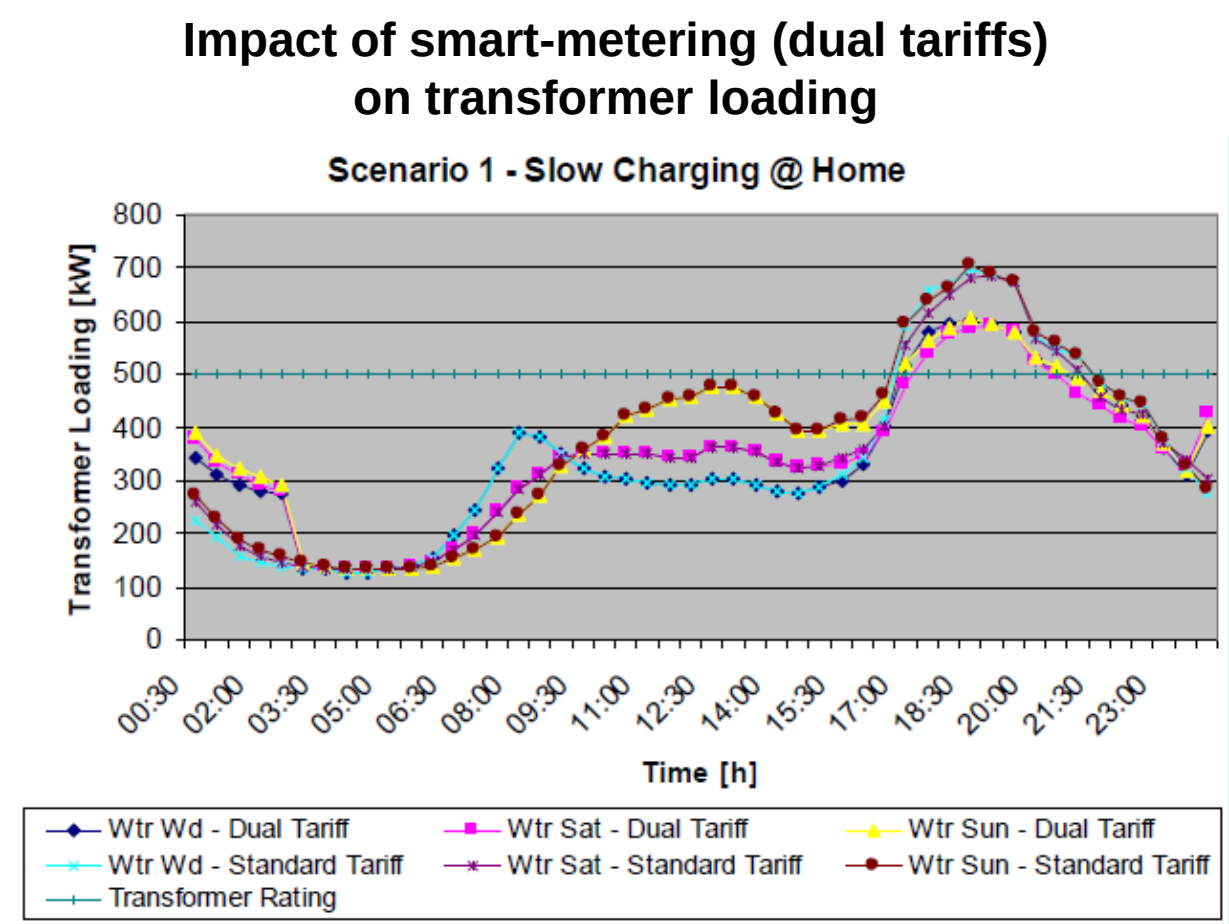
Grid impacts are manageable, particularly with smart metering, but some local grid reinforcement may be needed



Element Energy 2009

- EV share of national electricity production
  - 2020 0.1 – 2%
  - 2030 1 – 8%
- Smart metering with differential pricing can discourage peak demands
- Could create night-time base load for renewables
  - Flattening of daily demand profile will create efficiencies for generators
- Vehicle to grid unlikely to feasible due to battery constraints

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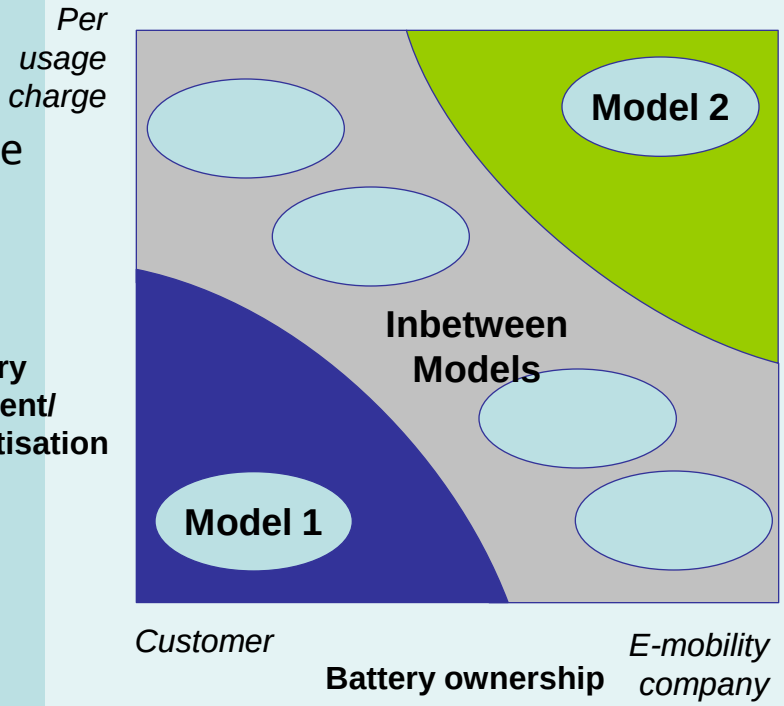
A range of business models are being considered – the pathways to profit remains uncertain

Model 1

- Vehicle manufacturer sets battery standard for its own vehicle range and markets vehicle including battery
- Utility company sets up charging infrastructure
- Customer buys vehicle including battery and charges battery at charging station (home, e-charging station, …) and pays for electricity consumption only

Model 2

- E-mobility company sets the battery standard and owns the battery
- E-mobility company sets up charging and battery exchange infrastructure
- Customer charges battery at charging station or swaps complete battery
- Customer pays for electricity consumption and battery amortisation



There is uncertainty whether the strong support offered by the former Government will be maintained

- Creation Office of Low Emission Vehicles
- £250M purchase support fund for cars
  - 2011-14
  - £5k per vehicle
- £140M Low Carbon Vehicle Innovation Platform
- £30M infrastructure support
  - Plugged-in-Places
- £5M Ultra-low carbon car competition
  - 340 vehicles
  - Joint cities demo programme
- £20M public procurement support for electric vans

The elephants in the room

Short-term – Public sector cuts
Long-term - Fuel duty revenues

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Biomethane offers a cost-effective renewable fuels for large fleets of HGVs but there remain major market challenges

- Current duty incentives make biomethane a cost-effective relative to diesel

- Market expansion is constrained by
  - High capital cost of natural gas vehicles
  - High cost of infrastructure for small fleets (<20)
  - Limited biomethane availability for transport
  - Generous ROCs incentives for biogas
  - Limited recent UK experience
  - Conservative sector
  - Low residual value of vehicles

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Incentives and support for biomethane in transport are proposed – but could be withdrawn with funding cuts

- Natural gas buses receive 100% duty exemption (19.26p/ kg)
- From 2010-13 the duty differential on NG will be retained
- Biogas buses now receive additional 6p/km payment as a low carbon emission bus (c£3k pa)
- Proposed £3.5M demonstration fund for biomethane in transport

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Key messages

- The introduction of renewable transport fuels presents new opportunities for Centrica
- EVs will play an important role in reducing transports dependency on oil and reducing GHG-emissions in the longer term as one of a portfolio of low carbon technology solutions
  - Early visionary vehicles do not make a mass market
- There are significant medium-term barriers to mass-market EV adoption, notably:
  - Battery cost and performance
  - Car buyer acceptability
  - Availability of practical recharging solutions
- To 2020-5, market penetration is likely to be modest even with generous incentives
- Grid impacts are generally small and will be alleviated by smart-metering
  - Local distribution network may require reinforcement in some areas
  - EVs provide an important new use for overnight baseload capacity
- There are a range of possible businesses models – routes to profitability are less clear - don't expect quick returns
- Biomethane is a promising fuel in heavy duty vehicles

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Any Questions?

020 3178 7859

The Low Carbon Vehicle Partnership

secretariat@lowcvp.org.uk

www.lowcvp.org.uk

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