

Low Carbon Bus Market in the UK and Barriers to Technology Take-Up

Low Carbon Bus Symposium
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Low Carbon Vehicle Partnership

Thursday, 3rd April 2014
Engine Shed, Bristol



Low Carbon Vehicle Partnership

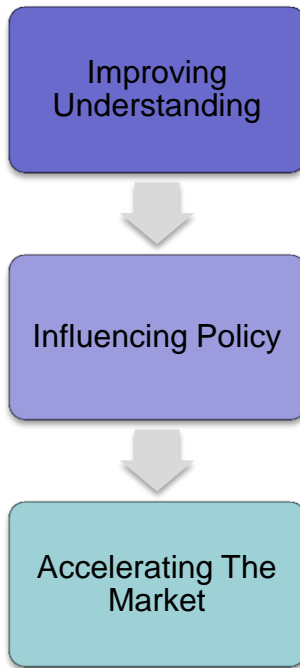
Overarching Goals

- ❑ Reduce road transport CO2 emissions
- ❑ Accelerate the shift to sustainable low carbon vehicles and fuels
- ❑ Create opportunities for UK business

Activity Areas & Working Groups

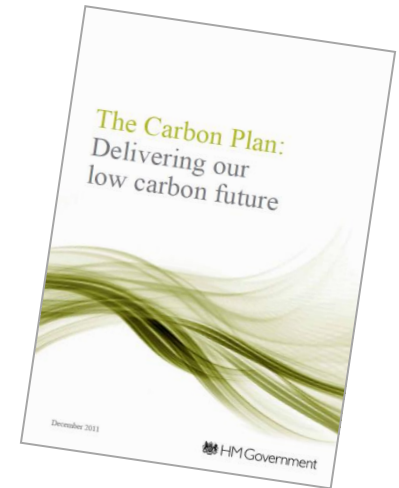
Public-Private Partnership
180 members across the road transport sector

Principal Aims



Background to Low Carbon Buses?

- Government climate change targets
 - 34% GHG reduction by 2020, 80% GHG by 2050
 - Road transport – 21% CO2 emissions of which 4% due to buses
- Improving local air quality
 - EU infringement of UK failure to meet NO2 limit value
 - Bristol - buses & trucks contribute 56% NOx emissions, AQMA declared
- UK economic growth
 - Bus manufacturing contributes to automotive sector growth



LowCVP – Bus Working Group – Influencing market take up of LCB

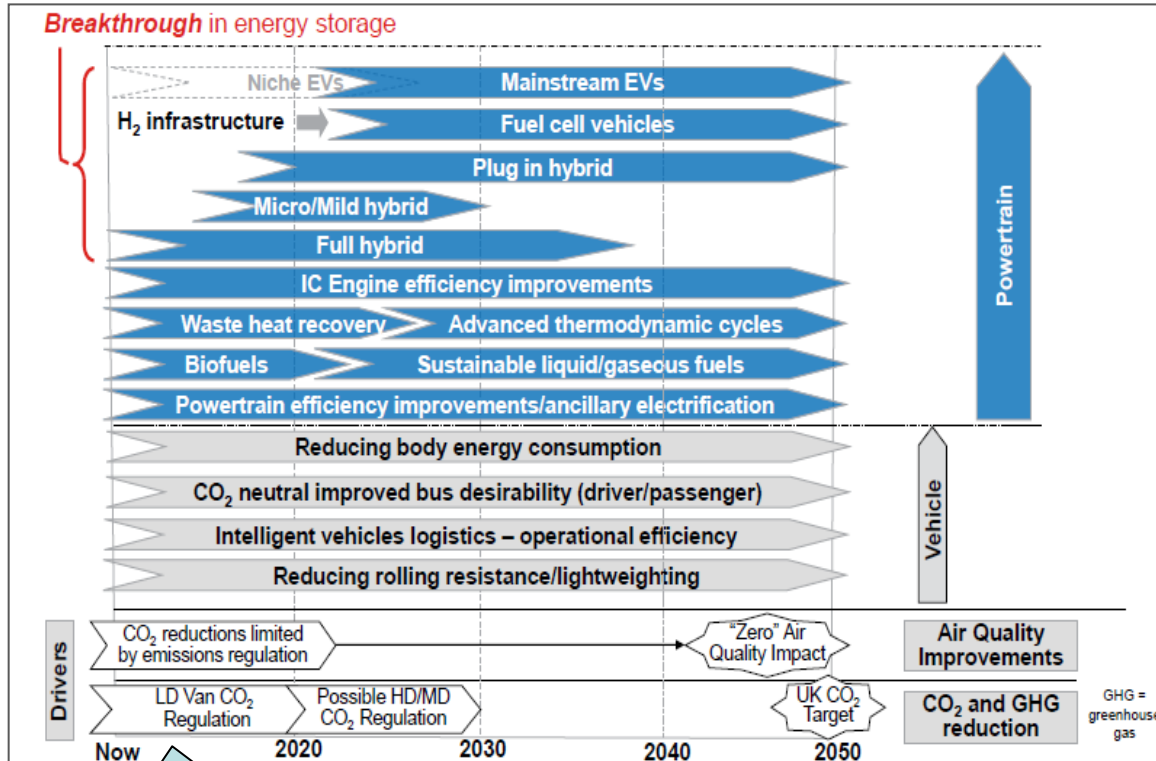
- Low carbon emission bus definition and accreditation scheme
 - >30% WTW GHG emission compared to Euro 3 diesel bus
- Green Bus Fund & BSOG additional 6p/km for LCEB
- Local Authority Low Carbon Bus Toolkit
- Creation of a Low Carbon Bus Technology Roadmap to 2050
- Barriers and opportunities to expand the low carbon bus market study (*on going*)



BWG chaired by Mike Western TfL > 30 members including bus OEMs, SMMT, fuel providers, bus operators, local authorities



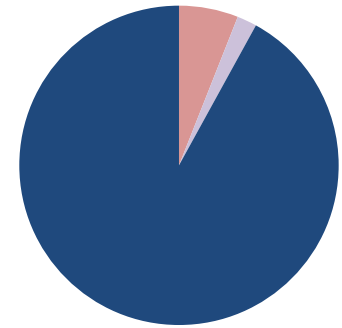
Low Carbon Bus Technology Roadmap



Low Carbon Technology Roadmap (LowCVP/Ricardo 2013)

Where is the UK now?

- 1467 low carbon bus
- 2% bus market
- Diesel hybrid dominate
- GBF important EV/hybrid sales



Gas EV Hybrid

Diesel Hybrid Buses

Technology/Market Status

- Technology - Combination of ICE and lithium battery to power bus
- Series or parallel in configuration, combined with start-stop
- Options: single and double deck
- Manufactures: Alexander Dennis Ltd, Wrightbus, Volvo, Optare
- Market: 1355 hybrid operating across UK

Environmental/Cost

- WTW CO2 savings: 30%
- Lower air pollution emissions
- Payback: > 10yrs
- Fuel saving: circa 30% (DD)



London, Manchester, Oxford
highest take up of hybrids



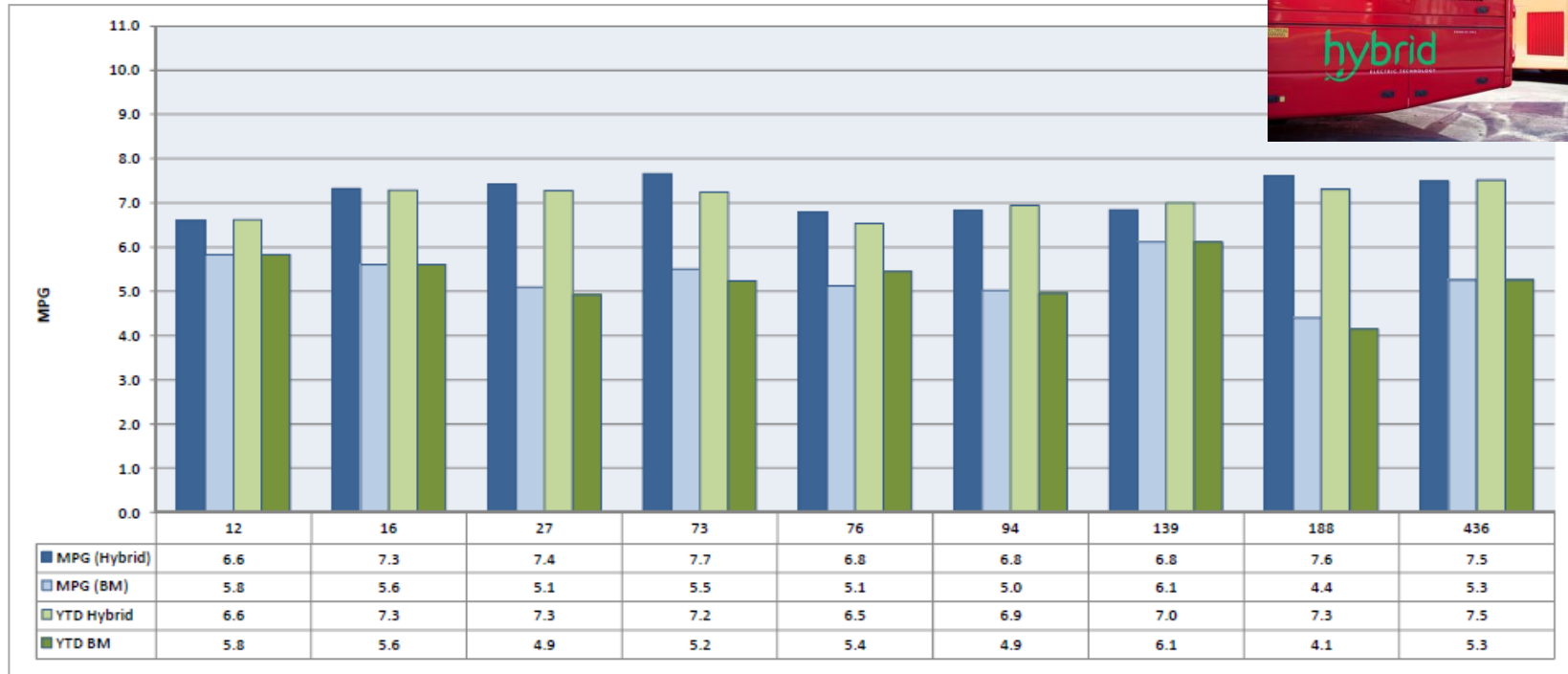
Note: Env/Cost comparison Euro 3 diesel bus
Pay back includes BSOG no LCB subsidies

Bristol operates 8 hybrid buses

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Influence

Hybrid Bus Performance Transport for London



Ref: TfL Quarterly monitoring report March 2014

Electric Buses

Technology and Market Status

- Technology: bus driven entirely by electric motor powered lithium battery
- Options: single deck
- Requires recharging infrastructure
- Manufacturers: Volvo, Optare, Wrightbus
- Market: 35 electric buses operating in UK

Environmental/Financial

- WTW CO2 savings: 30% (influenced by carbon intensity of grid)
- Air pollution emissions: zero
- Pay back: >10yrs



Gas Buses

Technology/Market Status

- Spark ignition engine powered by natural gas/biomethane
- Options: Single deck
- CNG refueling infrastructure required
- Manufacturers: MAN and Scania/ADL
- Market: 65 gas bus operating in UK (global NGV market)

Environmental/Financial

- WTW CO₂ savings biomethane: >100%
- Air pollution emissions >50% reduction
- Fuel savings: 20%
- Payback: <5yrs



Biomethane can be produced from any biodegradable waste



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Demonstration Trials

Flywheel hybrid

- Energy storage based on KERS, can be retrofitted.
- Williams Hybrid Power systems with Go-Head Group trials in London (9) & Southampton (30).
- Flybrid with Wrightbus – demonstration forthcoming
- WTW CO2 savings: 15-25%
- Fuel savings: 15-25%
- Pay back: 5years



Hydrogen Fuel Cell

- Fuel cells convert the chemical energy of hydrogen into electrical energy that powers the bus
- Hydrogen buses (6) in London forthcoming Aberdeen
- Tail-pipe emission: 100%
- WTW CO2 savings: 17-94%
- Pay back: > 15 years



Induction Charging for EV

- Wireless charging for electric and plug-in hybrid buses
- Trials Milton Keynes (Wrightbus Streetlight) and London (BYD)



LowCVP study - Barrier and Opportunities to Advance the UK Low Carbon Bus Market

Study Objectives

1. Identify the barriers to advancing the low carbon bus market in the UK
2. Outline recommendations for overcoming non fiscal barriers which could be implemented by key stakeholders
3. Outline a range of fiscal mechanisms that could be adopted by Government to scale up the low carbon emission bus market.
4. Examine the costs and benefits of selected technologies on a 'case study' basis with an estimation of uptake volumes against different pay back rates.

Methodology

Interviews with stakeholders and desk based analysis – Transport and Travel Research Ltd and Bus Working Group

Deliverables

3 sub reports, final report May 2014.

Technologies Examined

Diesel hybrid
Hydraulic hybrid
Electric
Flywheel
Ethanol
CNG/biomethane
Light-weighting plus smart ancillaries

Organisation type	Number interviews
Bus operator	12
Local Transport / Integrated Transport Authority / PTE	4
Transport for London	1
Manufacturer	3
Technology supplier	1
Leasing company	1
Passenger Transport Executive Group	1
Total	23

Interim findings - barriers to uptake and suggestions for stimulating the market

Key Barriers to Take Up

- High capital cost of some technologies (hybrid/EV)
- Concern of battery life and replacement cost for these technologies
- Infrastructure CNG and battery EV require significant investment
- Range concerns regarding EV
- Concern of performance in real-life standard test cycle (used to define LCB)
- Insufficient steer/guidance on future of the low carbon technologies and Government support
- Application process for funding can be complicated and always fit financial planning.
- Confusion over which technology is best
- Uncertainty regarding environmental benefits (LA)
- Reluctance of operators to adopt LCB (LA)

Over Coming Barriers

- Continued availability of subsidies or reduction in purchase price
- Support of linear subsidy rate based on level of CO2 saving
- Support for infrastructure
- Working in partnership to share knowledge
- Guidance on what low carbon techno available
- Gov to provide stronger steer on information regarding LCB
- Demonstration of techno important
- Low emission zone and other transport policy measures

Concluding Comments

- ❑ Low carbon buses have an important role in reducing CO₂ & air pollution emissions & can help bus operators reduce fuel costs.
- ❑ Good progress in the low carbon bus market in the UK but still niche market. Rest of world focused on natural gas or electric buses.
- ❑ Key barriers to take up - high upfront costs for hybrid and electric, confidence in performance of LCB, cost of infrastructure.
- ❑ Technologies such as gas/biomethane and flywheel achieve pay back within 5 years without GBF.
- ❑ What will help – review of DfT fiscal policy to accelerate market take up, provision of information on different technologies and their performance for bus operators & sharing of real world data will increase confidence in low carbon buses.
- ❑ BWG will undertake a new piece of work looking at specific policy interventions which can help advance the low carbon bus market.

Thank You



For Further Information & About How to Join
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