

Barriers and opportunities to expand the low carbon bus market in the UK

EXECUTIVE SUMMARY

Prepared for the LowCVP by Transport & Travel Research Ltd, in partnership with TRL.



June 2014



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Version: Final 1.2

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1 INTRODUCTION

The overall aim of this study was to identify barriers and driver to expanding the UK low carbon emission bus (LCEB) market¹, and propose support mechanisms to stimulate further growth. An assessment was made of the potential market uptake of a range of low carbon technologies, including the resulting emission savings, and case studies of low carbon emission bus operations in the UK. It was supported by industry experts from the LowCVP Bus Working Group.

The study was structured around the following set of tasks:

- **Task 1 Barriers and drivers** – Consult on levels of interest in low carbon bus technology options and barriers / drivers to market growth. Use qualitative interviews with the key stakeholder groups: bus operators, bus manufacturers, technology developers, leasing companies and local transport authorities.
- **Task 2 Incentives** – Review fiscal & non-fiscal support mechanisms, and produce an analysis of the key financial support mechanisms and their impact on payback rates for a range of LCEB.
- **Task 3a Take-up rates** - Examine costs, benefits and likely take up of selected low carbon technologies through a survey of bus operators, and estimate likely market share for LCEB if their cost/price ratio delivered on specified payback rates.
- **Task 3b Case studies** – Produce case studies of LCEB in operation, including financial and non financial considerations.

2 STATE OF THE UK LOW CARBON EMISSION BUS MARKET

2.1 Drivers

Various drivers have pushed the recent uptake of LCEB and created market growth.

Financial:

- Need for improved fuel economy from local bus operations.
- Grant support for capital investment via the Green Bus Fund, giving operators an opportunity to renew bus fleet with the latest vehicles / technology.
- Provision of running cost support (i.e. enhanced Bus Service Operators Grant (BSOG) for LCEB of 6ppkm and Scottish BSOG).

Vehicle characteristics:

- A relative ease of adopting new technologies, and confidence in reliability of vehicles.

¹ Low carbon emission bus (LCEB): A vehicle that produces at least 30% fewer greenhouse gas emissions than a current Euro III equivalent diesel bus of the same total passenger capacity. The greenhouse gas emissions will be expressed in grams of carbon dioxide equivalent measured over a standard test, and will cover 'Well-to-Wheel' performance, thereby taking into account both the production of the fuel and its consumption on board. A vehicle must be certified by the manufacturer that it meets these conditions

- The future is perceived as one of increased electrification in bus design and current LCEB are the link to that outcome.

Specific support that helps reduce the risk of investing in LCEB for local bus operations:

- TfL support (including long contracts), and other local transport authorities interest and support.
- Manufacturer support, warranties and infrastructure packages.

Other relevant factors:

- LCEB meeting environmental aims (to reduce carbon and air pollutant emissions).
- Competitive edge to operator and/or city from adopting 'green technology' plus enhanced public image and reputation.

2.2 Barriers

Significant barriers remain to a sustained market growth of LCEB and there are risks of current progress being disrupted.

LCEB technology characteristics:

- High purchase price of vehicles due to additional technologies and high cost of components for bus manufacturers and technology developers, influenced by the limited volumes from the UK market alone.
- Infrastructure requirements for gas bus refuelling and battery electric bus recharging.
- Cost and replacement concerns over energy storage (i.e. batteries).
- Requirement for specialist maintenance, in some cases.
- Constrained range of passenger capacities, for some types of LCEB.

Weakness in current market support mechanisms:

- Funding competitions are relatively complex, and timescales often do not match with the financial cycles of bus operating companies.
- Residual values are uncertain, which affects operators and leasing company confidence and mean a short payback time is required to mitigate risk (compared to the full vehicle life).
- Many in the industry are anticipating a reduction in financial support for LCEB.

Information and understanding:

- There is perceived to be a lack of guidance on the best LCEB options for different operations.
- There is a lack of freely available information on real-world performance in terms of fuel consumption and emissions of carbon and local air pollutants in a format that is perceived relevant for different local conditions and operating profiles.

2.3 Views on existing incentive mechanisms

There are specific LCEB incentives that have built on a set of underlying bus subsidies, one of which is BSOG paid for each litre of fuel used by registered local bus services in some areas of the UK. The Green Bus Fund part-funded the additional cost of a LCEB compared to standard diesel bus and a specific component of BSOG was introduced which provides an enhancement of 6 pence per km (ppkm) for qualifying LCEB. These incentive mechanisms have been vital to the growth of the LCEB market and development of innovative and reliable options that meet a range of operating requirements and environments. However, views were expressed on some possible shortcomings of current incentive mechanisms that could inform how available subsidy is delivered in the future.

Existing support mechanisms:

- Capital grant competitions have uncertain outcomes, and combined with fixed timescales that may conflict with bus operator investment plans, mean a higher level of effort for applicants and undermines careful planning.
- The 30% carbon reduction target to gain LCEB status is potentially stifling ambition in the LCEB market with anecdotal evidence that the most cost effective approach is to do 'just enough' to cross the 30% threshold, rather than keep improving fuel efficiency through investment in any additional components or packages. There are also lower cost options for gaining a lower degree of benefit that may be appropriate, particularly for in-use vehicles.
- Total removal of BSOG (currently paid on a per litre of fuel basis) might stimulate fuel efficiency measures (and stimulate interest in LCEB), but may also reduce levels of available investment for new vehicles.

Future support mechanisms:

- An incentive to support running cost of LCEB that stays with that vehicle for its life is strongly supported, to encourage second use buyers for these vehicles.
- A focus on retrofitting or removing older buses is needed (post-Equalities Act) now that low floor bus are near universal in order to tackle the remaining high polluting vehicles.
- Support for refuelling infrastructure is vital for some LCEB options (gas and electric) given the high financial and non-financial expenditure (i.e. time) needed to install refuelling stations, and this has been provided other vehicle types (cars and HGV).

Non-financial support mechanisms:

- Demonstrations and real-world evidence from relevant bus operations are vital to build understanding and confidence about how different types of LCEB will perform, within their likely range, in the specific operating environments for which they are being considered.
- Partnerships between bus operators and local (transport) authorities are important and valued by both types of organisation.
- Other transport policies and actions provide useful levers for encouraging LCEB take up (e.g. Low Emission Zones, Air Quality Management Areas, low emission strategies).

2.4 Take-up rates

Bus operators are showing considerable interest in LCEB by investing staff time and capital in co-developing, testing, trialling and operating an ever wider range of vehicles. A key factor in making a business case is the speed in which the additional investment costs will payback through reduced running costs. The study gathered information from operators (during Task 3), including the consolidated view of two major operating groups, that indicated acceptable payback times in years for the additional investment in LCEB. The mean values for each type of LCEB were between 5.5 and 7.5 years. Analysing how responses compared to the average produced take-up forecasts, which indicated:

Payback time	10+ years	Around 8 years	Around 5 years
Forecast of market uptake	2-3%	10-20%	50-85%
Commentary	Of interest to only a small minority of the market considering electric or hybrid buses.	Some interest in all types of LCEB as possible candidates for investment.	High levels of interest in each type of LCEB from significant segments of the bus operating market.

This information is relevant to designing future incentive schemes for LCEB as it provides insight on levels of growth that might follow from cost reductions for operators of LCEB that shorten payback rates.

3 RECOMMENDATIONS ON GROWING THE MARKET

3.1 Supporting energy efficiency and carbon reduction

The core BSOG support mechanism that applies to extensive parts of England and links litres of fuel used in local bus operations to a grant payment is directly undermining the business case of diesel fuelled LCEB, alternative fuel LCEB and a wide range of fuel efficiency measures. It is recommended that:

- BSOG in all its forms should take a technology neutral approach of supporting buses that avoids distorting the value of fuel economy improvements, whether it is administered by Government or devolved to the local transport authority.

3.2 Supporting vehicle operating costs and residual values

The BSOG element currently supporting LCEB (at 6ppkm) should be improved, as follows:

- A payment per km should continue to assist LCEB, but in future work on a sliding scale to ensure a fair and technology neutral approach based on % carbon saving. Vehicles with the highest carbon saving should receive more per % reduction than vehicles with a lower carbon saving. This would also help avoid the current 30% 'threshold' distortion of the market, and incentivise fuel saving above 30% where achievable and below 30% where considered valuable.
 - This subsidy should be attached to the specific vehicle that qualifies, for its lifetime, to enable long term planning and support LCEB re-sale values and therefore residuals.
 - This element of BSOG should be paid directly to the operator of the LCEB.

3.3 Supporting new vehicle investment

Grants, specifically Green Bus Fund, have been important in stimulating the current LCEB market to a significant size. Keeping up this momentum is important to drive down carbon and air pollutant emissions.

For vehicles:

- Capital grants should operate on a sliding scale in future, so vehicles with highest carbon savings qualify for highest support (as a proportion of the additional cost). Vehicles with the highest carbon saving should receive more per % reduction than vehicles with a lower carbon saving.
- Capital grants should be ongoing, rather than ad-hoc competitions as these do not fit well with normal business cycles.
- Capital grants should be truly technology neutral.

Lack of grants for gas re-fuelling and electric charging stations for bus may have hindered the growth of these LCEB options. Therefore, to support investment in the full range of relevant LCEB:

- Gas and electric charging infrastructure for bus fleets should be given support via grants or tax allowances on investments.

3.4 Other supporting activities

3.4.1 Test cycle design

A sliding scale incentive would need an appropriate certification basis to determine the value of each % of carbon saving and the reference point. Other elements that might be investigated and considered for inclusion are:

- A variety of real-life test cycles for London and non London operators for accurate carbon ratings and certification.
- Including pollutant emissions in testing and potentially the certification.
- Consider a requirement for a diesel comparator in LCEB tests or find another method to make comparator data available.

3.4.2 Carbon targets

DfT could set and communicate carbon targets for transport sector and component modes (e.g. bus), to indicate ambition and the required trajectory from current baseline, aligned with Climate Change Act 2050 targets and interim carbon budgets.

3.5 Further research

A range of future activities and project ideas arise from the research to date:

- Design a revised BSOG payment for LCEB (currently 6ppkm) with a graduated (i.e. sliding) scale) to support a greater range of LCEB performance which applies fairly to all technology options.
- Investigate a revised GBF (vehicle grant) scheme that rebates a proportion of a vehicle purchase cost based on carbon reduction with a graduated (i.e. sliding) scale, and is potentially open to all new vehicle purchases for an extended time window.
- Review and revise the LCEB definition and certification process to ensure it is fit for the purpose and requirements of graduated (i.e. sliding) scale support schemes. Part of this would be to examine the case for a new low carbon bus test cycle suitable to a more representative location, duty and route and propose the appropriate benchmark bus (euro or energy efficiency standard).
- Run workshops and regional meetings with Operators and local authorities, to share experience of trials, pilots and in-service experience; for example organised by LowCVP. This would raise confidence of some bus operators over their purchasing decisions by providing information and experience exchanges on LCEB operation.
- Investigate LowCVP setting up a brokerage service for bus operators to share (anonymous) detailed test and operational data on in-service and test track results from various LCEB bus in various



configurations, routes and duties. Investigate and propose incentives that will encourage operators to collect and share existing test data they already commission.

- Produce a revised, shorter version of the LowCVP '*Low Carbon Bus Technology Roadmap*' that is accessible to bus operators and includes up to date information on performance and financial costs, case studies of different LCEB fleets inside and outside of London plus information on trials. This to be updated annually and potentially draw together information from mainland European experience.

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