

# Accelerating the market for low carbon buses

*More than a thousand low carbon buses already operate in the UK and, with the right framework in place, there could be a lot more, as Neil Wallis and Andy Eastlake explain.*

Road transport is a significant contributor to man-made greenhouse gas emissions in the UK, in keeping with other developed countries, comprising around a fifth of total emissions. While buses and coaches make a relatively small contribution to this total (less than 5%), their share has been rising and, as a prominent form of public transport which governments aim to develop, operators are an obvious focus for initiatives to improve sustainability performance.

While the carbon saving credentials of mass transport have been more in the spotlight in recent years, by the nature of their operations buses are more prevalent in towns and cities where localised exhaust emissions such as particulates and nitrogen oxides are directly damaging to human health.

Efforts to encourage modal shift to buses and coaches from cars as a means to reduce congestion and improve social access to transport are inevitably harder to justify if high overall sustainability criteria are not met.

Stringent regulatory standards are already applied to emissions of local pollutants from buses and the UK now has one of the Europe's largest fleets of low carbon buses, thanks in large part to support from the government's Green Bus Fund. The Low Carbon Vehicle Partnership (LowCVP) worked with the Department for Transport to design and introduce the initiative.

Low carbon buses are defined by the government as those producing 30% lower greenhouse gas emissions than a normal diesel bus, based on a methodology developed by the LowCVP. Unique in vehicle regulation, the measure of greenhouse gases is tied to a comprehensive well-to-wheel analysis giving the full climate impacts of bus operations. With the change from traditional fossil fuel-derived diesel to electricity, biofuels, gas or even hydrogen, establishing the true carbon saving credentials of different technology options has become both more important and more complicated.

The LowCVP's Bus Working Group has also been active in supporting the government in the development of a policy framework for the revision of the Bus Service Operators' Grant. This provides a



One of London's eight hydrogen buses

subsidy on fuel used and thus reduces the incentive for fuel efficiency in order to establish a level playing field for low carbon buses.

There are now over 1,250 low carbon buses in operation in the UK, the largest share in London (nearly 500) but with 200+ in Manchester and around 50 or more in Liverpool, Reading and Oxford.

Most of the buses introduced under the Green Bus Fund are highly efficient diesel-electric hybrids, but there are also a number showcasing pure electric and gas technology. London and Milton Keynes are also currently carrying out trials on inductive charging for electric buses. The buses have been manufactured by ADL, Wrightbus, Optare, MAN, Scania and Volvo.

## Future technologies

The LowCVP recently launched a 'Low Carbon Bus Roadmap', based on a study to identify the most cost-effective options for the introduction of low carbon technology for buses. The report, prepared for the LowCVP by Ricardo, found that a wide range of innovative technologies can cut carbon emissions from buses and provide a short-term payback at current fuel prices and subsidy levels.

It developed technology roadmaps to illustrate when these technologies are likely to be ready for deployment into the bus market, focusing on the timescales 2012–2020 and 2020–2050. The study also examined the wider role of the selected fuels and technologies for decarbonising heavy goods vehicles.

The report focused on a variety of promising vehicle and powertrain technologies including light-weighting,

battery electric and various hybrid architectures including stop-start, mild, diesel electric, mechanical flywheel, and hydraulic hybrids. The study also covered a range of alternative fuels including compressed natural gas, biomethane, hydrotreated vegetable oil, second generation biodiesel and hydrogen. Payback times for the selected technologies for both single and double-deck vehicles were calculated both with and without current UK bus subsidies.

The study confirmed a number of technologies (eg full electrical hybrid) with the potential to make very significant improvements of over 30% to bus carbon dioxide emissions, but showed that the most technically effective technologies can have high investment costs with payback periods as long as 20 years. Hence, intervention in the form of subsidies or regulation is required to encourage their implementation.

The study also identified several technologies (such as mild hybrid and flywheel hybrid) for which the emission benefit was slightly smaller but still significant, at up to 20%, and with payback periods of less than four years – which could be commercially feasible without subsidy.

In the area of fuels, the study showed that the use of biofuels can give significant reductions in well-to-wheel carbon emissions. Biomethane could be particularly attractive as a drop-in fuel to replace fossil derived natural gas.

## Next steps

Overall, the study indicates that significant improvements in bus carbon dioxide can be achieved in the medium to long term through development, incentivisation (or regulation) and implementation of new vehicle technologies and fuels.

While the LowCVP has traditionally focused on the reduction of carbon emissions, it has maintained a close eye on the air quality impacts of road transport to ensure that carbon reductions are not achieved at the expense of higher local pollution. In developing the Low Carbon Bus Roadmap and through a growing understanding of market drivers, it's clear that the potential air quality benefits, which are often coincident with the technologies adopted in low carbon buses, could be a key market driver for uptake.

The LowCVP has commissioned an extension to the Low Carbon Bus Roadmap to further assess the air quality impacts of the low carbon bus solutions identified in the report.

As our energy and environmental priorities change opening up a wide variety of potential technology and fuel pathways for transport, the selection of technology for specific applications has become an integral part of bus operators' planning. ●

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