

## Accreditation of Low Carbon Buses

Following the definition of the emissions performance of Low Carbon Buses based on a Well-to-wheel CO<sub>2</sub> figure vs. passenger capacity, a standard for the testing and accreditation of Low Carbon Buses have been developed.

The standard is a structured document and includes an overview document with attached annexes and appendices

The overview document provides an explanation of the process by which Low Carbon Buses can be accredited and includes

- Definition of a low carbon bus
- CO<sub>2</sub> target
- Explanation of well-to-wheel CO<sub>2</sub> calculations
- Test requirements
- Test cycle definition
- Qualification requirements

The test requirements are provided as detailed annexes as follows

Annex A1	Test procedure for buses powered by conventional powertrain
Annex A2	Test procedures for buses powered by charge sustaining hybrid powertrain
Annex A3	Test procedures for buses powered by charge depleting hybrid powertrain
Annex A4	Test procedures for buses powered by pure electric powertrain

The development of these procedures builds on experience gained by The Energy Saving Trust in the testing of hybrid-electric and pure electric heavy-duty vehicles, and heavy-duty vehicles powered by conventional powertrain.

Procedures 1 to 3 have their origins in the procedure outlined in SAE J2711 – “Recommended Practice For Measuring Fuel Economy and Emissions of Hybrid-Electric and Conventional Heavy-Duty Vehicles”.

Procedure 4 is based on UNECE Regulation 101 – “Uniform provisions concerning the approval of passenger cars powered by a hybrid electric power train with regard to the measurement of the emission of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range, and of categories M1 and N1 vehicles powered by an electric power train only with regard to the measurement of electric energy consumption and electric range”

*and* - BS EN 1986-1 – “The measurement of energy consumption and range of pure electric heavy-duty vehicles”

The content of both procedures is adapted to ensure suitability for the testing of heavy-duty vehicles and specifies the use of the Millbrook London Transport Bus Test cycle (MLTB)

Each procedure has associated appendices as follows:

- Appendix 1: London Transport Bus Test cycle
- Appendix 2: Examples of Well-to-Wheel calculations
- Appendix 3: Passenger capacity vs. Greenhouse Gas Emissions (CO<sub>2</sub> equivalence)
- Appendix 4: Essential characteristics of the vehicle
- Appendix 5: Test report and approval

The test and accreditation sub-group of the Low Carbon Bus Working Group reviewed these documents on 15 February 2005, and following recommendations for amendments, two documents are presented for review and final acceptance by the working group. These are:

- Guidelines for the Accreditation of Low Carbon Buses
- Annex A2 - Test procedures for buses powered by charge sustaining hybrid powertrain and appendices 1 - 5 as described above.

Annex A2 is the most complex of all the procedures and is therefore presented as the model for the others.

A method for determining the road load performance of Low Carbon Buses was also produced as an appendix. The sub-group felt that, whilst this procedure followed conventional practice as included within the procedures for emissions homologation of passenger cars, a simplified approach could be adopted for buses. This will involve the production of standard inertia and chassis dynamometer settings. It is proposed that this will be based on data from the body of data available from testing over the MLTB.

Whilst the standard is intended to include details of how manufacturers and operators can apply for Low Carbon Bus accreditation, the sub-group was unable to progress a number of items. These are:

- Definition of an application form for accreditation as a Low Carbon Bus
- Definition of any financial aid or grant structure

It is assumed that these issues will be addressed as the Low Carbon Bus programme is defined.

Steve Bell

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