

Certification of a Low Carbon Emission Bus

Guidance for bus manufacturers

Introduction

In April 2009, the Department for Transport introduced a change to the Bus Service Operators Grant (BSOG) for bus operators using Low Carbon Emission Buses (LCEBs). From 1 April 2009, an additional payment of 6p per kilometre will be paid for all eligible kilometres (including dead kilometres) operated by LCEBs.

A LCEB is a bus that is able to achieve the LCEB target for Greenhouse Gas Emissions, which is equivalent to a 30% reduction in its Greenhouse Gas Emissions compared to the average Euro 3 diesel bus of the same total passenger capacity.

A vehicle will **not** qualify as a LCEB simply by using a fuel type which allows it to achieve a 30% reduction in its Greenhouse Gas Emissions, unless the fuel it uses is a biogas.

In order to identify that a particular vehicle is eligible for the LCEB incentive, the vehicle's manufacture will need to issue the bus operator with a certificate, certifying the vehicle as a LCEB based upon an independently witnessed emission test of a vehicle of the same type.

A mock up of a certificate is at annex A. It sets out what must be included in the certificate issued by bus manufactures. Bus manufacturers are free to create their own certificate based on the attached, providing it includes all the details required.

An original certificate must be provided for every LCEB purchased by a bus operator. However, there is no requirement for each individual bus to be tested. The process is based on a type approval.

In addition to providing a copy of the certificate to the bus company, manufacturers should send a copy of all certificates they issue to the Department for Transport's BSOG Administration team at the following address:

BSOG Administration
Department for Transport
Room F14, Ashdown House
Sedlescombe Road North
St Leonards on Sea
East Sussex
TN37 7GA

Definition of a Low Carbon Emission Bus

The definition of a LCEB is as follows:

“A Low Carbon Bus produces at least 30% fewer Greenhouse Gas Emissions than the average Euro 3 equivalent diesel bus of the same total passenger capacity. The Greenhouse Gas (GHG) emissions will be expressed in grams of carbon dioxide equivalent measured over a standard test, and will cover “Well-to-Wheel” (WTW) performance, thereby taking into account both the production of the fuel and its consumption on board”.

The LCEB emission target is expressed as a function of total passenger capacity and is shown as:

$$\text{CO}_2 \text{ (WTW)} = 6.28 \times \text{total number of passengers} + 502$$

The Greenhouse Gases (GHG) of interest are Carbon Dioxide (CO₂) Methane (CH₄) and Nitrous Oxide (N₂O). The relative “global warming potentials” for these 3 gases are 1:21:310 respectively. These emissions will be expressed in CO₂ equivalent using the global warming potential to weight the emissions of each gas.

How to carry out the emissions test

To determine whether a bus is a LCEB, a two step procedure is used. Firstly, a whole vehicle test is undertaken to measure the tank-to-wheel emissions and energy consumption. Secondly, the results of the whole vehicle test will be used to calculate the Well-to-Wheel (WTW) emissions. This will then be used to compare with the target line (set out below) to determine whether the bus meets the criteria of a LCEB.

Whole vehicle test - The whole vehicle test, which measures Tank-to-Wheel (TTW) emissions, may be carried out at any competent and independent emission test centre. The test must use either the Millbrook London Transport Bus (MLTB) test cycle, based on Route 159 in London, or an equivalent alternative test cycle. If an alternative test cycle is used, it must be based on a similar average speed as the MLTB test and have similar number of stops per kilometre. Any non-MLTB test must be approved in the advance by the Department for Transport.

The gas values of methane and nitrous oxide, if measured, will be converted to carbon dioxide equivalent by applying the weightings given above and added to the carbon dioxide emissions to provide a CO₂ equivalent g/km figure.

Well-to-wheel emissions - The results of the whole vehicle test, or TTW emissions, will be used to calculate the CO₂ equivalent emissions performance of the vehicle on a WTW basis appropriate to the fuel as used in the approval test and as used in service. In the case of biodiesel the fuel pathway used will be that of diesel to avoid BSOG providing an incentive over and above the incentive provided by the Renewable Transport Fuel Obligation (RTFO).

The WTW emissions are the sum of Tank-to-Wheel (TTW) and the Well-to-Tank (WTT) performance with CO₂ equivalent emissions expressed as CO₂ equivalent grams per kilometre, this is then assessed against maximum passenger carrying capacity.

The Well-to-Tank (WTT) emissions and energy consumption will be determined using an appropriate analysis such as those carried out by CONCAWE or by L-B-Systemtechnik GmbH or similar body, subject to approval by the Department for Transport. The results are expressed in grams of carbon dioxide equivalent per MJ of fuel delivered. Knowing the fuel consumption of a vehicle in MJ/km, the WTT CO₂ equivalent figure can be expressed in g/km.

Accreditation

In order to be accredited as a Low Carbon Emission Bus, vehicles must have CO₂ equivalent emissions either on the target line, or below that determined for their passenger carrying capacity. Buses found to have CO₂ equivalent emissions higher than that corresponding to its passenger capacity will not be afforded Low Carbon Emission Bus status.

The whole vehicle emissions when tested, on an appropriate chassis dynamometer to LowCVP Low Carbon Bus test requirements, must be reported.

Low Carbon Emission Bus status will be conferred on all vehicles similar to those presented for test, as long as the vehicles use similar fuels and energy management strategies.

Full Details

Full details on the method of accreditation and testing procedures for low carbon emission buses are available from the Low Carbon Vehicle Partnership on request to LCEB@lowcvp.org.uk or can be download from the Low Carbon Vehicle Partnership's website www.lowcvp.org.uk/LCEB .

Low Carbon Bus Target Line

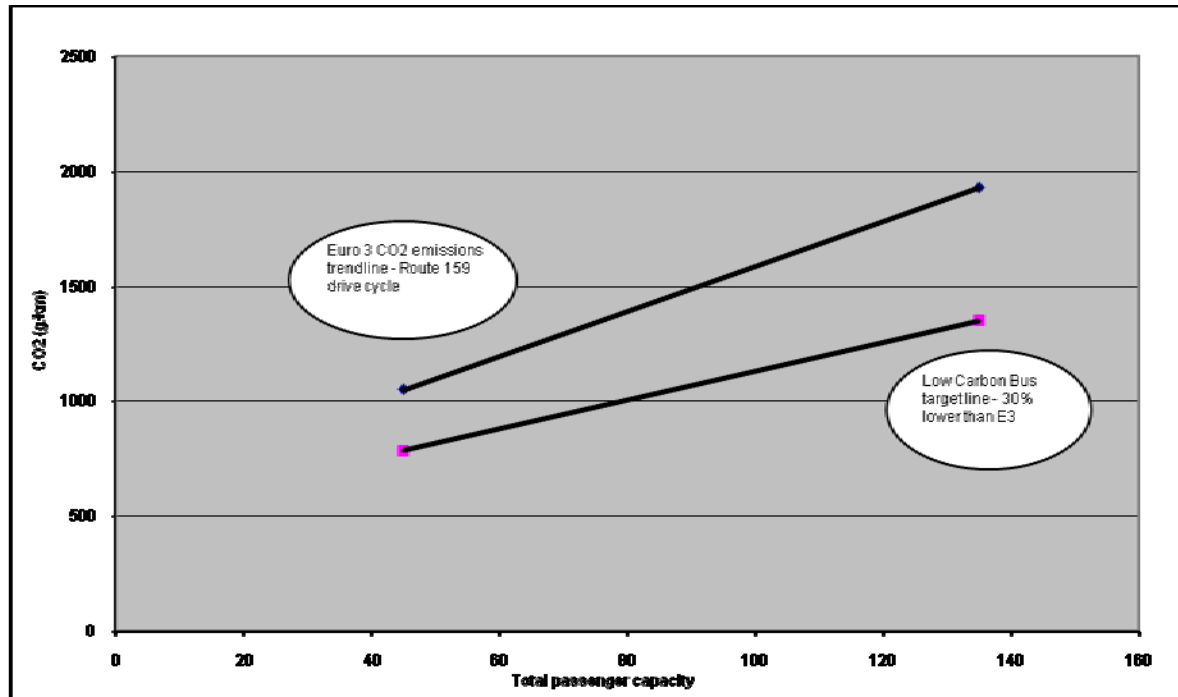


Figure 1

Certificate for a Low Carbon Emission Bus

Annex A

This is to certify that:

Bus Type	<input type="text"/>
Bus Chassis Number	<input type="text"/>
Registration Number	<input type="text"/>

is able to achieve the Department for Transport's Low Carbon Emission Bus (LCEB) target for Greenhouse Gas Emissions.

A vehicle of the same type as the bus described above underwent an independently witnessed emission test as follows:

Date of test	<input type="text"/>
Name of test centre	<input type="text"/>
Maximum passenger capacity for the vehicle	<input type="text"/>
Type of fuel used during test	<input type="text"/>
Emission test results for:	
CO ₂ (g/km)	<input type="text"/>
CH ₄ (g/km)	<input type="text"/>
N ₂ O (g/km)	<input type="text"/>
Calculation of the Tank-to-Wheel Greenhouse Gas Emissions	<input type="text"/>
Calculation of the Well-to-Wheel Greenhouse Gas Emissions	<input type="text"/>
Well-to-Wheel Greenhouse Gas emissions for a comparable diesel Euro III bus of the same passenger capacity.	<input type="text"/>

Details of person issuing certificate

Name	<input type="text"/>	Name of company	<input type="text"/>
Signature	<input type="text"/>	Phone Number	<input type="text"/>

Instructions for completing the certificate

The **Bus Type** and **Bus Chassis Number** must always be completed by the manufacturer. If known, the **Registration number** should also be completed, though this can be added by the bus operator if it is not known at the time the certificate is issued.

The **Date of test**, **Name of test centre**, **Maximum passenger capacity for the vehicles** and **Type of fuel used for the test** are all self explanatory.

The **Emission test result** should be included for each of the gases tested and should be expressed as grams per kilometre (g/km).

The **Calculation of the WTW Greenhouse Gas Emissions** for the bus tested and the comparable Euro 3 diesel bus should be expressed as grams per kilometre (g/km), and calculated as;

$$\text{GHG TTW (g/km)} = \text{CO}_2 + 21 \times \text{CH}_4 + 310 \times \text{N}_2\text{O}$$

$$\text{GHG WTW (g/km)} = \text{GHG TTW} + \text{GHG WTT emission factor}$$

For the comparable Euro 3 diesel bus the WTW Greenhouse Gas emissions should be expressed as grams per kilometre (g/km), and calculated as;

$$\text{GHG TTW (g/km)} = 502 + 6.28 \times \text{Maximum Passenger Capacity}$$

The **Name**, **Signature**, **Name of Company** and **Phone number** should be self explanatory.