

Buses: Procura+ Key Criteria - Extended version

1	INTRODUCTION	1
2	PROCURA+ KEY CRITERIA – DIRECT BUS PURCHASES	4
3	PROCURA+ KEY CRITERIA – TENDERED PUBLIC BUS SERVICES	5
4	FURTHER IDEAS	7
5	ENVIRONMENTAL CRITERIA FOR OTHER FORMS OF TRANSPORT	8
6	RELEVANT PRODUCT LABELS	9

1 Introduction

Public bus services represent one of the most financially significant and also visible public services provided. However the authority responsible for providing these services varies from country to country. Increasingly, public transport services are provided by private companies with service contracts awarded through a competitive tendering process. The sustainable procurement criteria presented below take this trend into account and are divided into those to be used when the public authority directly purchases vehicles, and those for use when tendering services to private or public companies.

1.1. Key environmental impacts

Impact		Approach
• Local health problems caused by particulate matter and ground level ozone	→	Purchase buses with low emissions
• Environmental damage caused by acidification, eutrophication and ground level ozone	→	Purchase buses with low emissions
• Generation of greenhouse gases through consumption of fossil fuels	→	Improve efficiency of driving style
• Considerable noise pollution	→	Purchase buses with low noise emissions

Exhaust emissions

The major environmental impacts caused by buses relate to exhaust emissions from the consumption of fossil fuels (petrol and diesel) during the working life. In urban areas buses are responsible for a relatively large proportion of carbon monoxide (CO), nitrogen oxide (NO_x) and particulate emissions. Such emissions are the cause of major respiratory and other health problems. They also contribute to a loss of biodiversity and stunted plant growth through the following environmental impacts:

- Acidification – the deposition of acidifying substances
- Eutrophication – the build up of excessive nutrients in soil and water
- Ground level ozone – formed through the reaction of NO_x and VOCs¹

¹ Volatile organic compounds (VOCs)

Many buses now exist on the market with substantially lower emissions of these harmful substances.

Greenhouse gas emissions

The consumption of petrol and diesel clearly also contributes to greenhouse gas emissions, although the overall impact of CO₂ emissions from public transport in comparison to all vehicle emissions in cities is relatively low. Encouraging the use of buses instead of private transport is, of course, a very effective method of reducing such emissions.

A number of alternative fuels are now available which offer considerable reductions in CO₂ emissions, either based on different engine technology or on adapting existing engine types. Using these fuels typically requires the development of new refuelling infrastructure. There is still considerable debate about the most environmentally sound and economically realistic alternative fuel type to use. Procura⁺ Criteria for purchasing such buses will be developed within the next 2 years.

Even without considering alternative fuels, reductions in CO₂ emissions can be achieved through improving the efficiency of your driving style. Research has shown that the fuel efficiency of a vehicle is as much determined by how the vehicle is driven as the efficiency of the engine – studies claim that up to 20% of fuel consumption can be saved through so-called “eco-driving”. The installation of driving-style meters which monitor fuel use is standard in many vehicles these days and the influence on price is negligible. These meters allow drivers, when trained appropriately, to substantially improve the efficiency of their driving and allow supervisors to keep track of performance.

Noise emissions

In Europe’s congested cities traffic noise is also a serious problem. Traditionally urban public transport, i.e. buses and trams, has been one of the worst offenders in this area. However, on today’s market, a large variety of buses are available with very low noise emissions, without hindering performance or raising costs substantially.

1.2. Procurement considerations

With the increasing trend for competitive tendering for public bus services, many public authorities are no longer responsible for directly purchasing buses. Despite this, it is still possible to ensure that low emission buses are used in carrying out the services. Competitive tendering also offers other possibilities for improving the service offered, and consequently increasing the amount of people using the service.

As with most products, it is also important to consider how they are used. The style in which a bus is driven can have a major effect on the fuel efficiency of the vehicle. The installation of driving style meters helps, but should be complemented by appropriate training. This can be directly ensured through a competitive tendering procedure.

1.3. Cost implications

Most of the major bus manufacturers are now able to offer EEV buses for sale with normal engine models at only a very small price increase (typically around €5,000, with an additional filter check each year). Given that the usual purchase price of a bus is normally in the region of €200,000, and that the purchasing price only accounts for a small proportion of the total costs over the buses lifetime (including fuel, maintenance and disposal), this is a very small cost mark up.

Box 1: Price differences between normal and low emission buses

A pilot project in the cities of Berlin and Frankfurt an der Oder, initiated by The German Ministry of the Environment, demonstrated that over the lifetime of a bus, the cost difference between EURO III and EEV was negligible (about 0.01%) over the entire life-cycle (including purchase and disposal/resale, fuel and additional refuelling costs, maintenance, personnel and other running costs)

1.4. Relevant European legislation

Air quality is one of the areas in which Europe has been most active in recent years. The approach has been to develop an overall strategy by setting long-term air quality objectives. In 2005 the Commission's *Thematic strategy on air pollution* was published outlining plans to tackle a number of key pollutants – particulate matter (PM), ground level ozone, ammonia (NH₃), nitrogen oxides (NO_x), sulphur dioxide (SO₂), and Volatile Organic Compounds (VOCs) by 2020.

A new Directive on ambient air quality setting specific limits for pollutant emissions is currently being finalised. This Directive will bring together a number of previous pieces of legislation, including the Framework Directive 96/62/EC on ambient air quality assessment and management, and the three daughter Directives which set specific targets.

Many cities will have difficulty in reaching these limits. By targeting low-emission vehicles public transport can become part of the solution and not part of the problem.

More directly related to buses, the EU introduced the so-called EURO standards in 1992, to reduce vehicle emissions. These standards currently regulate the legal emission levels of both new cars and heavy-duty vehicles (including urban buses) and are applied progressively, becoming stricter over time. Currently, following Directive 1999/96/EC⁴ (and reinforced by Directive 2005/55/EC), the EURO IV standards are in force for all new vehicles, with EURO V to be introduced in 2008 for heavy-duty vehicles. These regulations also contain the voluntary EEV standard (Enhanced Environmentally friendly Vehicles) with even stricter limits than EURO V for heavy-duty vehicles.

Two different schemes are now used to test compliance with these standards:

- European Stationary Cycle (ESC), together with European Load Response (ELR – for smoke opacity) – not necessary for natural gas engines
- European Transient Cycle (ETC)

The emission levels for the EURO IV, EURO V and EEV standards are outlined in boxes 2 and 3 below, according to the test used:

Tier	Effective date	Carbon monoxide (CO)	Hydrocarbons (HC)	Nitrogen oxides (NO _x)	Particulate matter (PM)	Smoke
EURO IV	2005	1.5	0.46	3.5	0.02	0.5
EURO V	2008	1.5	0.46	2.0	0.02	0.5
EEV		1.5	0.25	2.0	0.02	0.15

Box 2 European emission standards (EURO standards) following the ESC and ELR tests (units in g/kWh, smoke in m⁻¹)

⁴ Directive 1999/96/EC of the European Parliament and of the Council, of 13th Dec 1999 on the approximation of the laws of the member states relating to measures to be taken against the emission of gaseous and particulate pollutants from compression ignition engines for use in vehicles, and the emission of gaseous pollutants from positive ignition engines fuelled with natural gas or liquefied petroleum gas for use in vehicles and amending Council Directive 88/77/EEC

Tier	Effective date	Carbon monoxide (CO)	Non-methane hydrocarbons (HC)	Methane (CH ₄)*	Nitrogen oxides (NO _x)	Particulate matter (PM)
EURO IV	2005	4.0	0.55	1.1	3.5	0.03
EURO V	2008	4.0	0.55	1.1	2.0	0.03
EEV		3.0	0.40	0.65	2.0	0.02

* Only applicable for natural gas engines

Box 3 European emission standards (EURO standards) following the ETC test (units in g/kWh)

The Commission is expected to publish a proposal for Euro VI emission standards in 2006. In addition to introducing more stringent emission limits, the Commission is required to review the need to introduce new standards for pollutants that are as yet unregulated, which may be related to the usage of alternative fuels and additive-based emission control systems, and to investigate whether setting an additional limit for particle levels and size is necessary, and, if so, to include it in the proposals.²

2 Procura⁺ Key Criteria – Direct bus purchases

The Procura⁺ key criteria for direct bus purchases focus on three aspects:

- **Emission standards:** The easiest approach to ensuring good emission standards for the buses purchased is to use the EURO standards. All new buses must currently meet the EURO IV standards. Given the market availability and competitive costing the approach taken in the criteria is to demand EEV standard buses. Through this, it can be hoped that a real market shift is produced.
- **Driving style:** Installing driving-style meters costs little and, if combined with appropriate training, is an effective way to reduce fuel consumption.
- **Noise emissions:** A large variety of buses are now available with very low noise emissions, without hindering performance or raising costs substantially. The standards targeted here are based on suggestions by the German Environment Agency, and go beyond the definition of low noise heavy vehicles specified European Directives

Direct bus purchases

Subject matter: *Purchase of low emission buses*

Specifications:

- *Vehicle engines must be certified as meeting the EEV standard for emissions, according to EC Directive 1999/96/EC*
- *All vehicles are to be fitted with driving-style meters to monitor fuel usage*
- *Vehicle noise emissions must not be higher than 75 dB (A) for vehicles with an engine power between 75–150 kW and 77 dB (A) for vehicles with an engine power above 150 kW⁷*

² www.dieselnet.com

⁷ Umweltbundesamt: Handbuch für umweltfreundliche Beschaffung, München 1999 (see also: VCD Fakten, Umweltstandards im ÖPNV e.V., Bonn 2001)

Implementation notes



Verification (emissions): All buses meeting the EEV standards when produced will be certified as such. The related information is included in the technical documents of the vehicle.



Verification (noise): Noise emissions are documented in the technical papers of the vehicles and can therefore easily be checked by procurers.

3 Procura⁺ Key Criteria – Tendered public bus services

The Procura⁺ key criteria for tendered public bus services are similar to those for direct purchases, but with a slightly adapted and expanded approach:

- **Emission standards:** It is unrealistic to think that operators will currently have a high number of EEV vehicles, neither can it be expected that the entire fleet will be renewed. A partial renewal of the fleet should however be aimed at, and therefore a certain percentage of vehicles complying with EEV standard should be encouraged. An increase in the amount of EEV buses used over the duration of the contract should also be targeted. Finally it is important that the whole fleet meets a certain minimum environmental standard. As such several criteria are suggested:
 - Minimum environmental standard for buses used in carrying out the service (EURO III)
 - Extra points for the number of EEV vehicles in the award phase of tendering
 - Contract provisions allowing the contracting authority to keep track of how much the EEV buses are being used, and encourage an ever increasing use.
- **Driving style:** Although the retrofitting of old buses with driving style metres is rather expensive, it must be made sure in the tender documents that at least the newly purchased vehicles are equipped with them. Appropriate training is also necessary to ensure the full potential efficiency gains are realised, and can easily be included in tendering.
- **Good quality service:** Encouraging people to use public transport instead of cars entails clear environmental benefits. Of course in order to increase public transport use, the service provided needs to be attractive. Contract provisions can be used to take advantage of the opportunities offered by the private contracting of services to ensure a good quality service is provided.

Tendered public bus services

Subject matter: *Contract for the provision of bus services in an environmentally friendly manner*

Specifications:

a) Emission standards:

- *All buses used in carrying out the service must have engines meeting EURO III standards, according to EC Directive 1999/96/EC. Where buses are not certified as EURO III, but technical after-treatment has achieved the same standard, this should be documented in the tender application, and approved by a credible third party. To be accepted as such, documentation must be provided that this third party has the appropriate technical expertise in vehicle technology and is fully independent of the bidder.*

b) Driving style:

- *All buses newly purchased after the award of the contract and used in carrying out the service must be fitted with driving-style meters to monitor fuel usage.*

Award criteria:

a) Emission standards:

The contract will be awarded to the tender applicant with the highest score of points, to be allocated according to the following scheme:

- *Engine EURO standard: 10 points (out of 100) – 1 point awarded for every 10% of buses to be used in carrying out the service meeting the EEV standard.*
- *Other: 90 points (out of 100)*

Contract provisions:

a) Emission standards:

- *The number of kilometres driven per year by EEV buses must be reported annually. This number must increase by 10% per year.*

b) Driving style:

- *All bus drivers involved in carrying out the service must be trained in a locally recognised institution on environmentally-conscious driving on a regular basis to increase fuel efficiency.*

c) Good quality service:

- *The operator must achieve a "good quality service", as evaluated by an independent market research company at the supplier's expense every year. The supplier must provide details of an appropriate market research company in the tender application*

Implementation notes

Verification (emissions): All buses meeting the EURO III, IV, V or EEV standards when produced will be certified as such. The related information is included in the technical documents of the vehicle. As stated in the criteria, for those buses where technical after-treatment has achieved EURO III standard the measures must be documented and included in the tender application, and this must be approved by a credible third party.



Award scheme: The exact points scheme used and the aspects considered will depend on the authority.



Contract clauses (tender documents): These special contract clauses must be made clear to potential bidders in the tender documents.



Contract clause (Good quality service): Assessment should be carried out one year after the commencement of the contract. Specific targets and goals must be set and agreed upon during contract negotiations. Three indicators should be used in judging the quality of service: passenger numbers, ticket prices and passenger satisfaction (assessed through a survey), with passenger numbers being of most importance. However, it has to be considered that operators are limited in their ability to influence passenger numbers, whereas local policies and other framework conditions have a big influence. The exact method for carrying out the assessment and analysing the results will be the task of the independent market research company contracted by the service provider.



Contract clauses (penalties for non-compliance): To ensure effectiveness, appropriate penalties must be included in the contract for non-compliance, for example withholding payment until compliance is achieved.

4 Further Ideas

4.1. Reducing harmful emissions – a different approach

Applying the EURO standards in direct procurement or competitive tendering is the simplest way of ensuring high environmental standards. There are, however, different ways of achieving a reduction in fleet emissions, and in order to leave the most possible flexibility to operators, a different approach might be more advantageous.

Another possible solution for competitive tendering is to include limit (or average) values for Particulate Matter (PM) and Nitrogen Oxide (NO_x) for the entire fleet in the contract, which become stricter over time. The operator would have to document the emissions regularly, based on the technical standards of the buses and the kilometres driven.

When tendering bus services, the contracting authority can go a step further than what is proposed as criteria for the fleet and demand that certified EURO III buses must reach the EURO IV standard concerning the emission of particulate matter through technical after-treatment, within a certain period of time. Such after-treatment should be approved by a credible third party. To be accepted as such, documentation must be provided that this third party has the appropriate technical expertise in vehicle technology and is fully independent of the bidder.

4.2. Vehicle disposal

There are two important issues to consider with regard to the disposal of vehicles that are no longer required, both by public authorities themselves, and by private service providers. Firstly, where necessary, vehicles should be scrapped in an environmentally appropriate manner, i.e. recycling of as much material as possible, the safe disposal of harmful substances and so on. Secondly, vehicles with a significantly lower environmental performance should not be sold on to countries where less strict environmental criteria apply. It is possible to offer bonus points in the award phase of tendering for an environmentally and socially responsible concept for the treatment of discarded vehicles.

4.3. Biofuels

Biofuels are liquid or gaseous fuels that are predominantly or exclusively produced from biomass. They are derived from energy crops and therefore may offer a more sustainable option in the long term than fossil fuels. Biofuels include ethanol, methanol, bio-diesel and bio-gas. CO₂ emissions over the fuel life-cycle are lower than with fossil fuels and there are also reductions in local air pollutants. Biofuels can be used to replace or supplement traditional fossil fuels for transportation.

There is considerable debate, however, about whether biofuels offer a genuine environmental advantage if negative environmental aspects related to their cultivation are considered, and also about which biofuel is preferable.

Current costs of production, combined with the relatively small market for the product can make the production of biofuels an unattractive investment. The introduction of its use must be supported by public authorities to enable it to compete with other fossil fuels. Currently, biofuels are generally not competitive in the absence of fiscal incentives and fully guaranteed supplies of raw materials at stable prices. Current drives to increase biofuel use may well improve the market situation and lead to their more widespread introduction.

4.4. Joint procurement of buses

The procurement of buses is one area in which joint procurement (several public authorities buying together) offers clear opportunities, as a high-technology sector with single standardised units of a generally high value (see Chapter IV, Section 5 in the printed manual, and the Joint Procurement tool on this CD-ROM, also available at www.procuraplus.org). Thus, co-ordinated bulk purchasing could lead to good results in terms of achieving lower prices and technological advances.

5 Environmental criteria for other forms of transport

5.1. Trams

In a number of European cities tram networks are used in place of, or alongside, bus networks. Rail solutions, such as tram systems are often preferred to road solutions as long as demand is high enough to keep the vehicles reasonably full. The inherent efficiency of steel wheels running on steel rails is appreciably higher than that of pneumatic tyres running on pavement; the difference becomes more pronounced as speed increases.

Though trams enjoy zero tailpipe emissions, it is important to recognise that air polluting emissions are created in the generation of the electricity used to power the trams. One way to reduce these is through the use of green electricity for tram networks.

The investment costs of installing such a system are, however, considerable. The principal costs include the construction of stations and track, the installation of overhead power systems, the purchasing of custom-designed buildings, right-of-way acquisition, and civil works such as bridges and tunnels. However, such systems present a number of important advantages including greater energy efficiency, reduced labour costs, better acceleration and thus faster journeys, and reduced land use.

When choosing between train types, the level of noise emissions represents the key area in which environmental improvements can be made. The Association of German Transport Companies (VDV) has drawn up a set of recommended specifications when purchasing new trams:¹³

- Vehicle noise emissions must not be higher than (outside):
 - 55 dB(A) in standing position (up to 63 dB(A) with air conditioning fully working)
 - 75 dB(A) when accelerating or slowing down
 - 79 dB(A) when driving

Noise emissions of trams do not only depend on the vehicle as such, but also on the state and the type of the tracks that run on. The basis for manufacturers should be that the tracks the vehicles will be running on comply with the standard E DIN EN ISO 3095. However, attention should also be paid to track maintenance to produce an optimal reduction in noise emissions, where the regular grinding of tracks and the application of lubricants are important measures.

¹³ See: VDV Schriften 154, 08/02, Geräusche von Nahverkehrs-Schienenfahrzeugen nach BOStrab, Verband Deutscher Verkehrsunternehmen (VDV), Köln 2002

5.2. Trolleybuses

As with trams, trolleybuses have zero tailpipe emissions, and through using green electricity to power them, very low environmental impacts can be achieved. In addition trolleybuses have lower noise levels than either buses or trams.

Electric trolley vehicles, with their lighter infrastructure, are inherently cheaper to construct than equivalent light rail systems, and have a carrying capacity that approaches parity. The recent expansion of light rail systems has a knock-on effect on trolleybuses; much of the electrical equipment is the same and standardisation will see lower costs. Compared to diesel buses, which also share components with trolleybuses, much depends on recent integration developments and sizeable production runs.

At present, the low volumes in which trolleybuses have been produced for EU markets results in the cost of these being around twice that of equivalent diesel buses. Purchased in larger volumes, trolleybus costs should tend towards parity with diesel¹⁴.

Generally the maintenance costs of a trolleybus have been shown to be far below those of a diesel bus because there is so much less that needs frequent attention. Compared with tramway infrastructure (wires and rails), trolleybus infrastructure (wires) can be installed for around 10% of the cost and disruption associated with tramways.

With effective traffic management giving buses sufficient priority, electric trolleybuses could provide the travelling public with much the same experience as modern trams, but at a fraction of the capital cost.

6 Relevant product labels



German
Eco-label
(Blue Angel)

RAL-UZ 59 Low-noise and low-pollutant municipal vehicles and buses

www.blauer-engel.de

¹⁴ <http://www.trolleybus.co.uk/campaign/financial.htm>