

“How can the EU support the use of technical measures in existing heavy duty vehicles” pre-workshop discussion paper

Contents

Introduction	1
Policy discussion.....	2
1. Introduction: The EU's remit	2
2. Common system at EU level for technical measure certification	3
3. Labelling of Euro standard for LEZs/road tolling.....	7
4. Enforcement against foreign vehicles.....	8
5. Harmonised road sign for LEZs.....	8
6. LEZ enabling Directive	8
7. Vehicle OEM and warranty issue	9
8. EU notification and LEZ guidance	9
Non-LEZ related issues.....	10
9. Common approach to cleaner fuels.....	10
10. Financial Incentives	10
11. State Aid and Notification Issues.....	11
12. EU Technical Measures Guidance	12
13. Information sharing resources	13
14. Other	13
15. Technical measures: impacts, costs and modelling	14
Appendix 1 Issues raised that are outside the remit of this work	20
Appendix 2 Table of certification schemes	20
Appendix 3 Drive cycle / bench test issues	20
Appendix 4 Further details with controlling NOx compliance	20
Appendix 5 Issues for the technical measures guidance	20
Appendix 6 Technical measure details	20

Introduction

Project purpose

The purpose of the project is to define concrete policy proposals at EU level, which could help to support the most promising technological options. In particular, the feasibility of a common system at EU level for vehicle certification that takes on board improvements of existing vehicles, in the context of Low Emission Zones/Environment Zones (referred to here as LEZs), charging systems (referred to here as road tolling), economic incentives, public procurement policies, etc. A number of issues were raised that were outside the remit of this project¹.

Workshop purpose

The primary purpose of the workshop is to discuss the proposed concrete policies for the EU to consider implementing to support the use of technical measures to reduce PM and NOx from existing heavy duty vehicles. The proposed policies have been developed in response from input from those around the EU working on these issues². We wish to find out whether these are the policies that are needed. If they are, there are a number of specific questions that we wish to have answered at this workshop. The idea of the workshop is to develop these policies – and others needed – as far as possible, so they can help you as soon as possible.

¹ A list can be found in Appendix 1.

² 57 respondents in 16 countries.

There will also be brief presentation of the data collected and reviewed on the technical measures themselves, their impact and costs – as presented in this paper. Feedback on these is welcome by email. The data from this will be used to assess the cost effectiveness of the measures using the EU TREMOVE model.

Paper purpose

1. To facilitate discussions at the workshop, and enable the maximum output of that single day with experts from around Europe.
2. To circulate this information to a wider audience than is able to attend the workshop to get their views, and in the case of fleet operators experiences and their costs for technical measures.

To that end, we would strongly recommend you read this document, and discuss it with relevant colleagues who are not able to attend, so that as many issues as possible can be resolved at the workshop.

We have provided a pro-forma to allow a) resolution of some of the issues that we may not be able to discuss in the workshop and b) for you to put your views in *ideally before the workshop – by Wednesday the 6th September*³ to help the workshop be able to get through as many questions as possible.

‘Health warning’

This paper is based on the collation of input we have received from colleagues around Europe and the US, together with the project team’s views, and in the case of the technical measures data, peer review and information from an operator survey. It DOES NOT include any views from the EU Commission, and inclusion of proposed policies in this document should not indicate that they have support from the Commission, or are necessarily implementable by the Commission.

Policy discussion

1. Introduction: The EU’s remit

When outlining “define concrete policy proposals at EU level”, it is worth mentioning the EU’s remit. The principle of subsidiarity requires that actions to support technological solutions, in the context of this project, are principally the remit of member states. However, EU has a role in;

- ensuring the free movement of goods and services,
- compliance with state aid legislation and
- encourage the interoperability of member state schemes.

To this end it is proposed that the EU undertake policies in the following areas;

- Common EU system for technical measure certification
 - Labelling scheme of Euro standards for LEZs
 - Enforcement against foreign vehicles
 - Harmonisation of road signs for LEZs
 - LEZ enabling directive
 - Vehicle OEM and warranty issues
- Non-LEZ issues
- Common approach to cleaner fuels
 - EU notification and LEZ guidance

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- Financial incentives
- State Aid and Notification issues
- EU Technical Measure Guidance
- Information sharing resources
- Other

To oversee work in this area in its entirety, and/or different parts of it, there would be an EU facilitated committee with representatives from with representatives from different member states, the Commission, those operating schemes, technical measure and vehicle manufacturers and operators.

We have taken input and combined this with the team's thoughts, and outlined possible options, with questions to be resolved. In all cases the proposals should read "It is envisaged that" or "it is proposed that", but for the sake of clarity this has been not repeated for each sentence. Therefore views on issues not specifically raised as questions are also welcome.

There are some urgent such as retrofit certification, LEZ guidance, and some possibly less pressing, but not necessarily less important.

2. **Common system at EU level for technical measure certification**

Issues

The most requested EU support was a common system of certification for retrofiting. There are 6 schemes in existence in the EU for PM, plus 2 in the US (for PM and NOx), and a table of their differing requirements is given in Appendix 2.

These could be adopted, adapted, or used as experience to build a new system.

The EU would have a facilitating role, providing the framework, and the actual scheme would be run by Member States (MS), and their appointees.

This certification is needed if LEZs or road tolling schemes are to set emissions standards other than Euro standards (i.e. achieve tighter particulate matter (PM) emissions standards than would be realisable with Euro standards⁴), or to allow retrofits to meet those Euro standards⁵. This is relevant for the LEZs planned in the EU at present (The Netherlands (1/4/07), Munich (1/10/07), London (start date 1/1/08), Berlin (2008), Denmark (1/7/08)), and may help with current issues with the Swedish LEZs.

Proposals

1.1. Envisaged scheme outline

1. The purpose of the EU common technical measure certification is to provide a common certification scheme to be adopted by any users with the EU. Users include MS, cities, transport bodies or any other body which might wish to use the certification scheme.
2. All issues relating to certification would be overseen by an EU-facilitated Committee with an expert review panel. They could review standards and procedures on a regular basis.
3. The process of certification would be undertaken by "certifying bodies" nominated by participating MS Governments or other users of the scheme. Certificates would be recognised by all MS.
4. Testing would be by approved testing-houses licensed by the certifying bodies.
5. Manufacturers would seek certification of their technical measure using a licensed testing-house to provide independent evidence to support this

⁴ As allowed for in the revised Euro Vignette "EURO emission class as set out in Annex 0, including the level of PM and NOx"

⁵ The scheme would/could have other advantages, and these are outlined in Appendix 2

application to a certifying body. Manufacturers would provide a “manufacturers certificate” to each vehicle fitted with a device.

6. A vehicle fitted with a certified technical measure would apply for a certification number from the certifying body. The registration number of the vehicle and the certificate number would be a key element of data to be shared with other certifying bodies across the EU.

1.2. Certification issues

1. It should be for PM and NO_x, with options to add other pollutants if need be (particularly CO₂ and other PM metrics).
2. It would verify to different levels of emissions reduction, to allow for different schemes around Europe (e.g. Level 1: 30% reduction, Level X: 95% reduction), but also state the exact reduction achieved. Each LEZ/road tolling scheme could then choose the level of emissions reduction that were valid for their scheme.
3. It needs to be able to satisfy all potential LEZ/road tolling scheme uses - manual (sticker), vehicle number plate recognition (database), transponder (such as Autopass, database), satellite tracking and other intelligent infrastructure enforcement of LEZs/road tolling, so that each scheme could choose their appropriate enforcement method. All would be linked with the same certificate id-number. Any systems and equipment should have as much interoperability as possible, between the LEZ/road tolling/other uses, in all EU countries, and even beyond.
4. Each “certifying body” would issue a sticker, certificate and an entry to the database (for camera-based schemes) on production of vehicle registration documents and “manufacturers certificate”. There would be an option to provide suitable data/equipment to enable transponder or satellite tracking systems, either at the time or later, to allow the operator to upgrade their system to access a differently enforced LEZ.
5. It could be self-funding, by charging the manufacturers to certify their technical measures and possibly also charging vehicle operators to certify vehicles.
6. How long a retrofit program might last could depend on the speed of new vehicle penetration, particularly in the Eastern part of the EU, whether CO₂ and further air quality technical measures are developed.

1.3. Envisaged further details

1. Information on certification schemes would be available in each MS, with links to the schemes in other countries. The EU could host an EU-wide website, providing links to the MS certification schemes.
2. Enforcement: Each LEZ/road tolling scheme needs to be able to confirm that a certificate is valid (whichever enforcement system is used). They will need to know/find out:
 - Certificate number (e.g. UK 399948875)
 - Is certificate valid ?
 - When is it valid to and from ?
 - Licence number of the vehicle – for enforcement
 - Transponder / satellite system details (if relevant) – for enforcement
3. Equipment could be certified as being able to be used on its own, or in combination with other stated certified equipment (e.g. SCR can often be fitted with together with a DPF).
4. Vehicles registered outside the EU are likely to be an important issue for boundary states. Foreign operators could apply through certifying bodies in MS, however there is nothing to stop a non MS adopting the certification scheme.

QUESTIONS

1.4. Certification Questions for the Workshop:

Key Questions for workshop

1. Is it needed?
2. **Adopt, adapt or new scheme?** There are already certification schemes in existence. There are three options – timescales may be a key issue here.
 - a) adopt a present scheme for PM and then add other pollutants – if so, which?
 - b) modify a present scheme – if so which one and how?
 - c) implement a new scheme with agreed requirements

Appendix 2 gives a summary of the current schemes.

Important Questions for workshop

3. **Engine family / vehicle application approval?** The scheme would verify technical measures for different vehicles/vehicle types to ensure compatibility with engine and vehicle profile. It could either:
 - 3.1. Certify engine family, as in many present schemes. In this case equipment supplier/fitters would be required to ensure that the vehicles specification, age and duty cycle were appropriate when fitting abatement equipment and establishing maintenance procedures. This would be checked as far as possible by the ‘certifying body’ and the penalty for non-compliance by suppliers/fitters would be de-certification of themselves or equipment they are fitting.
 - 3.2. Certify vehicle application, eg lorry, bus, refuse vehicle, as the different uses have different typical drive cycles, and therefore emissions, or different DPF regeneration profiles

This question is very much linked to the next question – bench or drive cycle testing, and Appendix 3 gives further details on this issue

4. **Test Requirements:** engine bench test or drive cycle?. Current European homologation emission test cycles for HDVs are on engine test benches, as are the current EU PM retrofit certification systems. Many of the inputs requested more appropriate drive cycles for the certification process to ensure that emissions are observed in actual operation. Both options have pros and cons and the issue of timeliness to assist in facilitating LEZs must be taken into account. Three options are proposed:
 - 4.1. **Bench:** *Pro:* already exists and in use, allows comparisons with Euro standard, and DPFs emissions reduction can be independent of drive cycle/bench test, as long as appropriate regeneration is included. *Con:* not as representative of urban driving as drive cycles can be, particularly for NO_x.
 - 4.2. **Drive cycle:** *Pro:* if chosen well can be more appropriate of the bench test. *Con:* wide variety of drive cycles⁶, choosing the wrong cycle could be less representative, likely to take a long time to agree on which cycle(s), does not allow comparison with Euro standards.
 - 4.3. **Combining:** bench tests combined with modelling to assess drive cycle performance, or bench tests, and then drive cycle requirements added later.What tests should be used for which technical measures? If drive cycles are included, so which one(s) for which technical measures? Should there be a list of approved cycle which are considered equivalent to the ESC and ETC engine homologation tests? This issue is discussed further in Appendix 3.
5. **What should be required?** Should it require:
 - a percentage emissions reduction
 - meeting a Euro standard for a particular pollutant

⁶ Drive cycles in the EU include ADEME cycles for urban buses, urban garbage trucks, trucks; TfL, Millbrook London Transport Bus Cycle; UK Energy Saving Trust waste vehicle cycles; UITP SORT method that can be adapted for the situation; ARTEMIS; TNO, Braunschweig

- fitting of specific technology (e.g. DPF)
- set limit values (g/kWh)
- a combination of the above?

Some options allow greater encouragement of retrofits than others. Should it also:

- allow the treatment of pollutants separately – e.g. PM devices?
 - look at particle number and ultrafines?
 - be technology neutral?
- 6. Other pollutants:** There are several options/proposals for this:
 - no increase in regulated pollutants
 - a tolerance of increase, due to test repeatability
 - stay within pre-technical measure Euro standard limit (requires a bench test)
 - maximum allowable increase in, or proportion of, NO₂
 - are there any increases that would be allowed (e.g. devices with additives)?
 - no increases in CO₂, N₂O or other greenhouse gases (GHG)
 - should other PM metrics be considered in the certification process?
 - 7. What should it include?** It could be a combined certification for all technical measures, including retrofits, conversions to or use of cleaner non-diesel fuels. This would incorporate interoperability principles and reduce the need for two very similar schemes. The test procedures for different types of technical measures would be different. Fuels are also discussed below.
 - 8. Enforcement of certification database.** Are the data envisaged (in section 1.3) above sufficient for enforcement? Is there a legal mechanism for this?
 - 9. Controlling compliance.** There need to be procedures for ensuring the continued correct use and performance of the technical measures installed, through e.g. an annual vehicle inspection or spot checks. This is particularly an issue for SCR retrofits where an additive is required. There is at present no appropriate NO_x test, and PM tests at low levels are not very reliable. Should it be a visual check for PM and something else for NO_x? Could/should OBD be required for NO_x retrofits? If OBD is required it would need agreed settings etc – which are already needed for OEM vehicles. Should/could there be OEM-type restrictions/safeguards for SCR, a warning light when not working, and after a period of time, reduce available power to 60%? Appendix 4 gives further details of the issues with controlling NO_x compliance.
 - 10. Start with PM only due to time considerations?** To facilitate LEZs considering the short timescales, and due to the continuing development of NO_x retrofits, and issues with NO_x testing should it start with a PM system, and then add other pollutants as procedures are agreed?
 - 11. Should there be registration of suppliers / fitters as well as equipment?**
 - 12. Should the scheme also be open for light duty and off-road vehicles?** For little additional effort, the scheme could include these vehicles. Certification for retrofits for light duty vehicles is needed for the German sticker/Berlin LEZ, and for off-road for the London Construction Best Practice Guide.
 - 13. Interim arrangements.** To ease the start-up of this system and operation of LEZs, should there be a transitional phase during which existing other certifications (e.g. Germany, Holland, Italy, UK RPC, Denmark) are valid? Would this resolve any EU Notification issues?

1.5. More detailed questions

These questions are not aimed to be discussed at the workshop. *However*, we would like remote feedback on these issues. For a number of these questions, options include those in the present schemes, in appendix 2.

1. Agreeing durability requirements.

2. Agreeing minimum retrofit manufacturer and fitter warranties.
3. Agreeing operator handbook requirements. Could include: maintenance procedure, true maintenance costs, maintenance to be required to ensure warranty validity, possibly allow increased maintenance costs to extend equipment lifetime.
4. Agreeing backpressure controls.
5. Agreeing the number of tests required, and whether previous data is ever allowed.
6. Defining core data for certification and manufacturers/fitters documentation.
7. Enforcement of foreign vehicles is an issue for many traffic offences (see below, topic 4), and EU subsidiarity may limit the EU's ability to have its own database. Options might include:
 - Certifying bodies produce an updated list of the above information, that is transferred to the LEZ/tolling schemes every night.
 - The EU housing a clearing house of data
 - REGNET procedures being used
 This needs discussing with the EU and relevant bodies.
8. Ideally there would be certifying bodies in each MS, but this would be difficult to be required by the EU. Where there is no certifying bodies in their MS, vehicle operators could apply for certificates in another MS. Would this be sufficient to satisfy the EU freedom of movement requirements?
9. Agreeing core manufacturer certificate data.
10. Should the retrofit allow alteration of the vehicle registration document? Or an amendment, or supplementary information?
11. Is there an issue of unclear legal status of retrofitted road vehicles?
12. Should it include natural gas refuelling station regulations for safety?

3. **Labelling of Euro standard for LEZs/road tolling**

Issue

Most LEZs planned have a requirement for Euro standards as well as, in some cases, retrofit. If LEZs are to go ahead and be able to require retrofits, they also need information on the Euro standards. It would be easiest, and most in line with interoperability if the two pieces of information were in the same system (so many of the same issues in respect of issuing the certificate/sticker/database entry etc), and would also allow retrofitting of a cleaner engine in an older vehicle.

For example the German sticker mechanism and Berlin LEZ require this combined approach. While there is a field in the EU vehicle registration database for Euro standard, not all countries (e.g. UK) have this filled in. This labelling could be used for vehicle without age on the vehicle registration documents – at present in this case vehicles are usually assessed on age – which does not give exact Euro standard⁷ or allow for replacement engines, and for manually enforced LEZs where a single comply/not comply identification is required.

While the automatic enforcement methods could work on pre-registration and vehicle age in the absence of any other information, manually enforced, sticker, systems would still need the Euro standard on the sticker, and having 2 stickers would be against the interoperability principle.

Proposal

1. Combine labelling of Euro standards for vehicles with the technical measures certification process – at the ‘certifying body’ stage – to increase interoperability.
2. It could include vehicle weight and length – for road tolling that varies by vehicle dimensions and emissions.

⁷ Some manufacturers complied before the deadline for all vehicles to comply, some did not.

3. Amend Directive 1999/37/EC to make Euro standard (and possibly retrofit equipment) mandatory on the vehicle registration certificate.⁸

QUESTIONS FOR WORKSHOP

Is labelling of Euro standard needed?

Is so, should it be combined with the retrofit certification, or another mechanism?

Should it also include light duty and off-road vehicles?

4. Enforcement against foreign vehicles

Issue

Non-payment and non-enforcement of penalties for traffic offences is a significant issue for MS currently and LEZs and road tolling schemes have the potential to be exploited in this way. Traffic offences are currently not covered by EU-wide legislation, as they are decriminalised. Vehicle licence agencies need to co-operate and share data, and not all are willing to do this due to Data Protection concerns. At present penalties are either not sent (as funds collected do not cover recovery costs), collected by debt-agencies (with limited success), a number of bi-lateral agreements, collected on the spot or as the vehicle leaves the country. None of these are satisfactory. There are a number of projects looking at this issue, but again, they do not resolve it satisfactorily⁹.

Proposal

1. The Certificate number, when is it valid to and from, vehicle licence number of the vehicle, transponder / satellite system details are on a database shared by those operating LEZ/road tolling schemes
2. Enforcement of penalties may be able to be done through LEZ/road tolling schemes in the home country of the offender, or through other mechanisms.

QUESTIONS FOR WORKSHOP

How much of an issue is foreign vehicle enforcement for LEZs/road tolling?

Can the data described be shared, and penalties issued by 'sister schemes'?

If not what else can be done about this issue?

5. Harmonised road sign for LEZs

Proposal

Develop a harmonised road sign for those approaching an LEZ. This will save each member state notifying on a road sign for LEZs, and having different road signs across the EU. This needs to be completed by the beginning of 2007, for the introduction of first LEZs planned.

QUESTION FOR REMOTE FEEDBACK

Is a harmonised road sign for LEZs needed?

6. LEZ enabling Directive

Issue

The EU LEZs working group recommended that the EU to develop a proposal for an EU Directive to facilitate the introduction of LEZs. For subsidiarity, any framework should leave a substantial room for manoeuvre for local schemes to fit the local context.

Proposal

1. A directive to facilitate LEZs under Article 175 in the Treaty, i.e. a minimum directive, which will give Member States possibilities to local adaptations, laying down under which circumstances local authorities are allowed to implement LEZs and what kind of restrictions the regulations can contain.

⁸ It is provided for in the EU harmonised vehicle registration document, but the data is not required.

⁹ These include EUCARIS/REGNET, Prum Convention, RESPER, RISER, eNFORCE, VERA Programme, CAPTIVE, London ALG "SPARKS" project, Dutch Government

QUESTIONS FOR WORKSHOP

Is an LEZ enabling directive needed?

Are there legal obstacles in any MS for this directive to overcome?

Could/should this be done through guidance?

Could such a Directive require MS to implement LEZs where there was a need?

7. Vehicle OEM and warrantee issue

Issue

A few OEMs claim that retrofitted equipment invalidates the warrantee, and most state if a fault occurs that is traceable to retrofit equipment then they will not be liable as it is not their responsibility. OEM involvement with the development of the certification system should help. Retrofit also has increasing issues due to the increasingly complex engine management systems of Euro 4 and 5 vehicles. This is also an issue for biodiesel and other emerging fuels at more than 5% blends.

Proposal

1. The EU could lead discussions with the relevant interest groups to resolve the warrantee and retrofit issue.
2. The alternative is for retrofitter to provide a warrantee to accompany the equipment – which should be a retrofit certification requirement.

QUESTIONS FOR WORKSHOP

Is OEM warrantee and retrofit a significant issue?

Should the EU lead/facilitate discussions?

Should the alternative of a retrofitter warrantee be used?

8. EU notification and LEZ guidance

Issue

Schemes such as LEZs and road charging need to be notified to the EU, due to the freedom of movement issue in the Treaty of Rome. LEZs should be allowed, and encouraged by the EU Commission, to help MS meet the air quality Directives. In addition to the issues of state aid (see later) the EU should make it clear what kind of schemes will be accepted, through EU guidance on LEZs. There should also be a realisation that LEZs are rarely, if ever, going to be self-funding, and are often politically difficult to implement, especially at the local level, so all the support possible is needed.

It is often difficult for vehicle operators to know what schemes are available, and those operating LEZs/road tolling to make the information widely available. Sharing information on this would help vehicle operators, and also help potential LEZ/road tolling scheme operators know what schemes are allowed.

Proposal

1. EU guidance on LEZs, giving sufficient framework to enable MS and cities to understand what is possible, but give sufficient flexibility for schemes to respond to local issues, often political or economic, such as vehicle included, emissions standards set or enforcement system used. The certification and labelling schemes will assist with this, and effectively form part of the guidance.
2. The guidance needs to be implemented as soon as possible, in discussion with those developing LEZs, and not risk becoming a further – later - barrier to developing an LEZ. If full guidance cannot be developed in time, then a quicker option is an outline of what is and is not allowable.
3. Establish an web-based EU-wide information scheme on LEZ, road tolling and other traffic restrictions

QUESTIONS FOR WORKSHOP

Should there be an EU LEZ guidance?

If so, what should it contain? What is the latest it needs to be available? Is a full guidance possible in this time, or should it be a briefer document, possibly followed up by a more detailed one?

Non-LEZ related issues

9. Common approach to cleaner fuels

Issue

There is at present no common EU-wide specification for non-diesel or petrol fuels for in-use vehicles, which limits their use. There is also no test for vehicles using such a fuel - for example all ethanol vehicles are tested when operating on petrol. This is relevant for ethanol, ethanol blends, biogas/biomethane, biodiesel, and other fuels such as Synthetic Diesel (Fischer-Tropsch). The quality of any conversions also needs to be controlled.

There is an EU working group under CEN looking at producing a specification for ethanol / E-85 (an ethanol blend), which would allow vehicles to then be optimised with this fuel. This procedure could be used for other non-diesel fuels.

There is a European WVTA (Whole Vehicle Type Approval) for Compressed Natural Gas (CNG) passenger cars and EU Natural Gas (NG) engine certification rules, also being introduced for other vehicle types that could be used. There is also a Swedish standard for biogas, and an agreed EU standard for natural gas.

Proposal

1. The EU working group method is used to set specification for non-petrol and diesel fuels
2. Vehicle conversions to other fuels should be covered under the technical measures certification process
3. Biogas/biomethane should be required to meet the existing EU-wide natural gas specification

QUESTIONS FOR WORKSHOP

What is needed for cleaner non-diesel fuels?

Should the EU working group system be used for other fuels?

Should vehicle conversion be certified? Then should this be through the technical measures certification as a single certification process?

Should the biogas/biomethane standard be that for natural gas?

10. Financial Incentives

Issue

There have been many calls for funding from those responding to this project. In many MS, grant funding for technologies and lower duty rates for fuels have been used to encourage uptake of technical measures, often to great effect. Some MS see financial incentives to fit the whole fleet, others that it is to kick-start the market and develop trials. Taxation and financial incentives are subsidiarity issues, and the remit of the MS. The EU has a role in terms of the state aid rules – which many of these schemes have had issues with – and guidance.

Research, development and demonstration (RD&D) is needed to assist technologies to come to market. There is a chicken-and-egg situation¹⁰ with technologies and setting LEZ standards - unless a technology exists and is well developed, it cannot be an LEZ standard. Once it has been set as an LEZ standard, there is the certainty in the market that will enable manufacturers to develop them. Public funding of RD&D is needed to bridge this gap and overcome these issues, and public procurement can help in market development, which is generally

¹⁰ Meaning it is difficult for one cannot start without the other coming first

accepted. However there may be some problems with NOx retrofit development still ongoing while LEZ standards are being set. Credibility and experience from pilots is needed before promoting technical measures wider.

Technical measures either need to be required or save money for significant uptake – either inherently, or with funding. There is a chicken-and-egg issue of lower volume production giving higher prices, so fewer purchases. This issue is closely related to the following issue of state aid, below.

Proposals

1. Guidance on what financial incentives are allowed (see state aid section), and which work best, in which situations.
2. Targeted, non-arduous funding streams are needed to support technical measure RD&D, from MS, regions and/or the EU.
3. Consider lower VAT on cleaner technologies

QUESTION FOR REMOTE FEEDBACK

Is EU guidance needed on which financial incentives work best?

Is lower VAT on cleaner technologies an option?

11. State Aid and Notification Issues

Issue

State aid rules follow from the Treaty of Rome, and have been an issue for many of the grants and fuel duty incentives, as these need to be notified and approved by the EU Commission. Notification is also required for LEZ and road tolling schemes. A framework for state aid is needed that allows, enables, and potentially even encourages, national and local subsidy, tax regimes for the use of technical measures and LEZs and emissions-based road tolling.

A number of schemes have been refused or delayed, and there is a *perception* amongst some in the wider community that the process is long-winded, not transparent, and leads to different outcomes for similar schemes. It seems that each case is decided on its individual merit, as a legal decision. There are separate state aid rules for transport and environment which do not necessarily work together as well as they could. The state aid environment guidelines are being reviewed at the moment, so it may be timely to input into this.

Proposals

1. Publish a list of schemes already approved. Information on the scheme should be clearly explained in non-legal language so that the scheme details can be seen, and easily searchable by those looking for schemes to copy. It would not have to give background or decision details or location, to make publishing less contentious, although location and even contact details would be preferable. It could compare to the present case law details from the Europa website– only aimed at implementers rather than lawyers. This would help MS know what was possible and speed up the process. A MS could say “I want to implement a scheme like X”, and as long as it was proved to be the same (with which the certification scheme would help), it could be allowed relatively quickly. It would also reduce the costs of managing state aid, ensure more consistent decisions, help prove that the system was open and transparent and reduce the perception of differential treatment.
2. Guidance on the kinds of financial incentives – and LEZ/emissions-based road tolling schemes allowable under EU law to act as a starting point for member states when they are developing plans and schemes, together with a description of those that cannot, preferably with reasoning.
3. Review the state aid process to ensure faster decisions and more consistent decisions – some of the measures included here would assist.

4. Consistent case officers for different each notified program or program type to reduce delays that occur when the case officer changes during a notification leading to questions being re-asked and the topic re-learned.
5. Speed up time taken to responded to questions. Often the maximum time allowable to respond is taken, dragging the procedure out.
6. Better guidance for both for the actual process and any informal discussions prior to notification on the issues that will need to be resolved to reduce the delay in seeking clarifications.
7. In the recommended procedures, a recommendation that if a MS approaches with a scheme that is not allowed but the aim is in line with other EU policies, the Commission should be able to say “what you aim to do could be done like this”.
8. If there are several MS with a similar scheme as far as possible these should be handled similarly and reviewed together, not risking re-inventing the wheel each time. If they cannot be handled by the same case officer or case officer team, then there should be consultation between the case officers.
9. Where necessary amend directives to ensure that the tax rate differentials can be a useful instrument to promote the use of technical measures. The present maximum is 30%, which is often not sufficient.
10. Council Regulation 994/98 allows a de-minimus ceiling¹¹ whereby aid less than this level is allowed and not required to be notified. This applies to all sectors except transport. Technical measures should be classified under the category “environmental protection”, therefore be allowed under the de-minimus ruling.
11. The issue decisions being time limited may warrant some attention, particularly in light of the length of time that notification procedures can take.
12. Present guidelines make it particularly difficult to promote cleaner and energy efficient vehicles, as costs are calculated on a 5 year basis, and if the measure breaks even/make money within that 5 years, then financial incentives are not allowed. However, vehicles often change hand within those 5 years, and 5 years is often not an appropriate timescale for operators. The rules should be changed to allow this.
13. Those notifying on LEZs to contact the relevant department in DG Environment, to facilitate discussions and the process through the EU, and to ensure some level of co-ordination. The facilitation of an informal discussion group, predominantly by email, but also meeting when appropriate, between these MS and cities would help develop LEZs, and help ensure consistency in the state aid process.

QUESTIONS FOR WORKSHOP

Would any of the suggestions help to improve the way state aid and notification operates for technical measures and LEZs? What else could be done?

12. EU Technical Measures Guidance

Issue

Where the EU has no direct control due to subsidiarity or other issues, it can sometimes influence member states through guidance. Guidance would also help increase consistency, but also needs to allow sufficient flexibility to tackle local issues – and could include sections on best practice, recommendations and links to further information. In addition to the specific guidances on LEZs and state aid, there may be need for a technical measures guidance, which could be available through the same web-portal as the retrofit/technical measures certification.

¹¹ 100 000€ over 3 years

Proposal

1. EU guidance on technical measures should be produced, and regularly reviewed given the changing field. Appendix 5 includes the issues that have been raised so far for inclusion in EU technical measures guidance.

QUESTION FOR WORKSHOP

Should there be an EU guidance on technical measures?

QUESTION FOR REMOTE FEEDBACK: Do you agree with the suggestions in appendix 5 for its contents? What else is needed? When is the guidance needed by?

13. Information sharing resources

Issue

Without information, operators will prefer what they know – for example buying new rather than retrofitting.

Where a product is in the early stages of bringing to market, a procurement consortium could reduce the costs and start setting up the market. If the EU facilitated an information exchange of those wanting to do this EU-wide, this would increase the potential markets and cost reductions. Examples of where this has been done is public procurement of ethanol in Sweden, and would be more effective done over a larger area.

A similar mechanism can be used where a product does not yet exist to meet the requirements, where a procurement consortium spreads risk and specifies the product needed, knowing it will take years to bring to market. The Forward Commitment is that you commit to buy significant volume if the product is developed satisfactorily and you enter into a contract to say that. This could be used to encourage development of retrofit technologies, and was outlined in work for the UK DTi and Cenex (UK Centre of Excellence for low carbon and fuel cell technologies)¹²

Proposals

1. Share practice EU-wide on pilots, problems/solutions, help, and use of technical measures to help develop new technologies, through a web-based resource, linked to any guidance. The resource would act as a focal point, and be regularly updated, and could be linked with the retrofit certification. This would aid development and demonstration, and reduce concern in countries where they are not yet well-used.
2. EU-wide public-private platform, under the Commission, to exchange experience and best practices between public and private stakeholders, which could be linked to the above item.
3. EU facilitation of a procurement consortium database to assist in the early states of bringing a produce to market.
4. EU facilitation of a procurement consortium database for product development.

QUESTION FOR REMOTE FEEDBACK

Would the information sharing schemes help? Would the procurement consortia help?

14. Other

Other solutions that do not fit under any of the headings above:

1. EU-wide framework for retrofit programs along the lines of the California Diesel Risk Reduction Program.
2. The availability of the AdBlue® additive for retrofit SCR and Euro 4 and 5 with SCR needs to be increased. Suggestions to tackle this issue welcome.

¹² Forward Commitment Project Low Carbon Van Exemplar

3. Supportive legislation to follow up the target of 2% natural gas by 2010 set in 2001 by the EU (as for biofuel targets).
4. The EU could be more flexible and give more weight to environmental concerns, versus for example competition.

QUESTION FOR REMOTE FEEDBACK:

Should the EU produce a framework for retrofit programs as above? Should the availability of AdBlue be increased, and if so, how? Should there be supportive legislation for the natural gas targets?

15. Technical measures: impacts, costs and modelling

The table below presents the data collated from questionnaires, literature review and peer review. These data will be transferred into a format that can be directly analysed by the model TREMOVE for the analysis of the cost-effectiveness of the scenarios and the analysis of the impact on pollutant emissions.

TREMOVE

TREMOVE is a policy assessment model, and can be applied for environmental and economic analysis of different policies as road pricing, LEZs, emissions standards, subsidies for cleaner cars etc.¹³. Fuel consumption and emissions factors are based on the Copert III methodology. Measures are assessed primarily on reduction of the four regulated emission (CO, NO_x, PM, VOC), for which it requires the input data for, as well as fuel consumption and the main greenhouse gases.

Scenarios will be run to estimate the effects of technical measures on existing captive fleets as a variation of the TREMOVE base case. Therefore, the following information is needed for each technical measure analysed:

- Impact on emissions and fuel consumption as correction factor related to the base technology (e.g. EURO-standard) of each vehicle category for the road categories “urban”, “non-urban” and “motorways” – or an averaged factor.
- Costs (as cost difference from the base technology) for capital and operation costs
- Penetration in the fleet¹⁴ as a share of each of the six heavy duty vehicle classes (Buses, Coaches, HDV<7.5T, 7.5-16T, 16-32T, >32T)

To reduce the scenario runs, it is proposed:

- to focus on the most important technical measures,
- to define combinations of technical measures to be implemented within the same scenario,
- to define different degrees of penetration rates (e.g. maximum, medium, small penetration) of vehicle stock.

QUESTIONS FOR REMOTE FEEDBACK:

Are the data in Table 1 below reasonable for the costs and emissions reductions from these technical measures below? Are there any gaps you can fill?

If not, please send us your views on what it should be with reasons and the evidence for the change.

What penetrations can each technology type realistically achieve?

Measures reviewed

¹³ See details on the TREMOVE model on www.tremove.org

¹⁴ i.e. what proportion of the fleet will be fitted

A detailed analysis of costs and benefits from measures reviewed is provided in Appendix 6. These are summarised in Table 1 below. The technical measures reviewed have been categorised as follows:

Summary

The technical measures reviewed have been categorised as follows:

Primary measures

- measures which have quantifiable benefits and are considered the most promising technical measures for reducing PM and NO_x appropriate for the policies within this project.

Secondary measures

- measures which, whilst not providing significant impact upon PM and NO_x, should be encouraged to be used in conjunction with primary measures.
- measures which appear to offer potential NO_x and PM benefits but which should be further examined to explore their potential in a European context.

Other measures

- immature or technologies not close enough to market
- measures not able to impact significantly upon the emissions from existing heavy-duty vehicles
- measures which appear to be too expensive versus other technologies offering similar or better emission benefits

This does not mean that they are not valid technologies, particularly in many cases in terms of CO₂ emissions.

Primary measures

Exhaust emissions retro-fit measures

- Diesel Oxidation Catalyst (DOC)
- Diesel Particulate Filter (DPF)
- Exhaust Gas Recirculation (EGR)
- Selective Catalytic Reduction (SCR)
- SCR+DPF
- Re-engining

Alternative liquid fuels

- Ethanol
- Diesel Water Emulsion (DWE)

Alternative gaseous fuels

- Conversions to dual fuel Natural Gas
- Conversions to dual fuel Bio-methane

Secondary measures

- Low Ash Lubricants
- Closed Crankcase Ventilation systems
- Measures to reduce impact of idle emissions – use of APUs, truck stop electrification

Other measures

Exhaust emissions retro-fit measures

- Lean NO_x Traps (LNT) – due to the early stages of development, difficulties with sulphur poisoning and very low sulphur fuel and lubricating oil requirements

Alternative liquid fuels

- Dimethyl-ether (DME) – due to the early stages of production and volume uncertainties
- Fatty Acid Methyl Esters (FAME) – due to the low impact on PM and NO_x emissions
- Synthetic Diesel (Fischer-Tropsch) – due to early stages of production and volume availability, and therefore uncertainties

Other measures

- Conversion to dedicated spark ignition Natural Gas or Bio-methane – due to erosion of air quality benefits compared with, for example, diesel plus SCRT plus DPF, and its relative lower efficiency.
- Fuel Additives (other than FBC) – due to the low impact on PM and NO_x emissions
- Retro-fit hybrid drives – due to their early stage of development, and therefore supply uncertainties
- Low Viscosity Lubricants – due to the low impact on PM and NO_x emissions
- Low Rolling Resistance Tyres – due to the low impact on PM and NO_x emissions

QUESTION FOR WORKSHOP: Do you agree with our screening assessment of which technical measures are cost effective to reduce PM and NO_x?

The characteristics of the most promising technical measures are shown in Table 1 below.

QUESTION FOR REMOTE FEEDBACK:

Are the data in Table 1 below reasonable for the costs and emissions reductions from these technical measures below? Are there any gaps you can fill? If not, please send us your views on what it should be with reasons and the evidence for the change.

Table 1. Summary of technical measures applicable to heavy-duty vehicles and captive fleets

Primary measures

Measure	Vehicle category	Emission standard/age	Emission reductions/changes related to the base case vehicle						Costs		Restrictions, Drawbacks
			NOx	PM	NO2	Fuel cons/ CO2	<1000 nm Solid particles	Other	Capital	Operation	
DOC	All heavy-duty	<u>Pre-Euro:</u> <u>>14 yrs</u> Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	Zero Zero Zero Zero	-20 to -40% -20 to -40% up to -20% up to -20%	up to 50% up to 50% up to 50% up to 50%	Zero Zero Zero Zero	Risk of increase	CO and HC: typically 80%. 90% with 50ppm Sulphur	€350 (small system) €1500 (large system)	Zero Zero Zero Zero	Sulphation (corrosion), NO2 emissions, PT emissions, other secondary emissions. Use as low sulphur fuel as possible to reduce effects
DPF (CRT®, catalysed)	All heavy-duty	Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	-2 to -4% -2 to -4% -2 to -4%	>99% >99% >99%	up to 50% up to 50% up to 50%	<+1% <+1% <+1%	>99% >99% >99%	CO and HC: typically 90%.	€3000 (small system) €7000 (large system)	Cleaning costs: Trucks - €350/yr Buses - €700/yr RCVs - €1400/yr Up tp 1% increase in fuel cost	Needs low sulphur fuel (<50ppm) Some older DPFs increase NO2
DPF (partial flow)	All heavy-duty	Pre-Euro: >14 yrs Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	Zero Zero Zero Zero	up to 50% up to 50% up to 50% up to 50%	up to 50% up to 50% up to 50% up to 50%	Zero Zero Zero Zero	Potentially zero	CO and HC: typically up to 80%. 90% with 50ppm Sulphur	€3000 (small system) €7000 (large system)	Will require cleaning but possibly at lower frequency than full flow filter	Lower PM reduction, potentially minimal impact on ultrafines.

DPF (FBC)	All heavy-duty	Pre-Euro: >14 yrs Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	-2 to -4% -2 to -4% -2 to -4% -2 to -4%	>99% >99% >99% >99%	Zero Zero Zero Zero	<+1% <+1% <+1% <+1%	>99% >99% >99% >99%	CO and HC: If fitted with oxycat typically 90% with 50ppm Sulphur fuel. Can reduce to 30 – 40% with 500ppm fuel.	€3000 (small system) €10000 (large system)	Cleaning costs: Trucks - €350/yr Buses - €700/yr RCVs - €1400/yr Up to 1% increase in fuel cost	Requires fuel additive and dosing system. Best with low sulphur fuel (<50ppm)
DPF (active regeneration)	All heavy-duty	Pre-Euro: >14 yrs Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	-2 to -4% -2 to -4% -2 to -4% -2 to -4%	>99% >99% >99% >99%	Zero Zero Zero Zero	<+1% <+1% <+1% <+1%	>99% >99% >99% >99%	CO and HC: zero to 90% depending on system of regeneration	€2300 (small system) €7000 (large system)	Cleaning costs: Trucks - €350/yr Buses - €700/yr RCVs - €1400/yr Up to 1% increase in fuel cost	May increase exhaust back pressure outside of manufacturers limits prior to regeneration.
EGR	All heavy-duty	Euro 2: 7 -10 yrs Euro 3: <7 yrs	Up to -50% Up to -50%	Risk of increase. Likely to need mitigation by DOC/DPF	Zero Zero	+2% +2%	Risk of increase		Cost for large veicle: €14000 to €16000	Up to 2% increase in fuel cost	Fuel consumption increase, potential accelerated engine wear. Mitigation of increased PM by DOC or DPF
SCR	All heavy-duty	Euro 2: 7 -10 yrs Euro 3: <7 yrs	-60 to -80% -60 to -80%	-20 to -30% -20 to -30%	Zero* Zero*	Zero Zero	Risk of increase	HC: typically 70% reduction. CO: up to 20% increase.	Cost for city bus: €10000 €15000 (with DPF)	Cost of Urea estimated at €1-2/100km	Needs urea injection system *Can increase N2O through oxidation of NH3
SCR+DPF	All heavy-duty	Euro 2: 7 -10 yrs Euro 3: <7 yrs	-60 to -80% -60 to -80%	>99% >99%	+10 to 50% +10 to 50%	<+1% <+1%	>99% >99%	CO and HC: typically 90% with <50ppm Sulphur.	€12000 (medium system) €15000 (large system)	Cleaning costs: Trucks - €350/yr Buses - €700/yr RCVs - €1400/yr Up to 1% increase in fuel cost Cost of Urea estimated at €1-2/100km	Needs low sulphur fuel (<50ppm) Needs urea injection system Can increase NO2 through oxidation of NH3

Repower to Euro 4	All heavy-duty	Euro 2: 7 -10 yrs Euro 3: <7 yrs	Zero Up to 50% Note; based on real world emission tests.	Up to 45% Up to 43%	Zero Zero	Up to +20% Zero	Could increase	E2 TO E4: HC: 60%, CO:55% E3 to E4 HC: 30%, CO: 25%	€16000 to €24000 Cost needs to be compared with like for like replacement cost	Maintenance costs expected to reduce. Fuel cost could increase up to 20%	Expensive. May not give reductions in solid particles Real world emissions benefits do not follow Euro standards
Ethanol	All heavy-duty	Euro 3: <7 yrs	Meets Euro 4	Meets Euro 4		60% increase due to lower energy density	Could increase	Meets Euro 4	Additional cost can be in region of €10000	Maintenance cost could be +50%	Dedicated engine
DWE	All heavy-duty	Pre-Euro: >14 yrs Euro 1: 10 -14 yrs Euro 2: 7 -10 yrs Euro 3: <7 yrs	-15% But variation in results from tests noted.	-50% to -60% But variation in results from tests noted.	Zero unless used with DOC (see comments ref. DOC)	10% increase	Could increase	Wide variation of results but CO and HC could increase up to 35%		Fuel cost could increase by 10%. However depend upon tax regime.	Emission benefits appear to be influenced by engine technology level and duty cycle
Dual fuel diesel/natural gas/biogass	All heavy duty, but primarily long haul trucks	Euro 3: <7 yrs	Meets Euro 4	Meets Euro 4	Zero	20% lower	Likely to be higher than diesel with DPF	HC: 80%, CO: 80%	€2000 to €5000	Payback possible in 2 years	Reduced payload, slightly increased maintenance costs. Catalyst required for CH4 management

The appendices listed below can be found in the separate document.

Appendix 1 Issues raised that are outside the remit of this work

Appendix 2 Table of certification schemes

Appendix 3 Drive cycle / bench test issues

Appendix 4 Further details with controlling NOx compliance

Appendix 5 Issues for the technical measures guidance

Appendix 6 Technical measure details