

**ECORails –
Energy efficiency and environmental criteria in the awarding of regional rail transport
vehicles and services**

ECORails

Deliverable 23: Training Module for the Guidelines Annex 12 Part 3/Issue 11 – Exhaust emissions (pollutants)

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Exhaust emissions (pollutants)

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Content

- 1) **Political and environmental relevance**
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- 6) **How to monitor the contract?**

Political and environmental relevance

- The emission of carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x) and particulate matters (PM) causes health problems and is therefore regulated by European and national environmental law.
- PM are also co-responsible for the greenhouse effect (which was recently examined by studies).
- PM and NO_x are also regulated by the EU air quality directive (2008/50/EG of 21st May 2008, Official Journal 152/1, and previous versions).
- If a certain level of PM-immission is exceeded on more than a given number of days per year, the authorities have to develop and execute air quality planning (since 2005).
- If a certain level of NO_x-immission is exceeded on more than a given number of days per year, the authorities have to develop and execute air quality planning (from 2010).

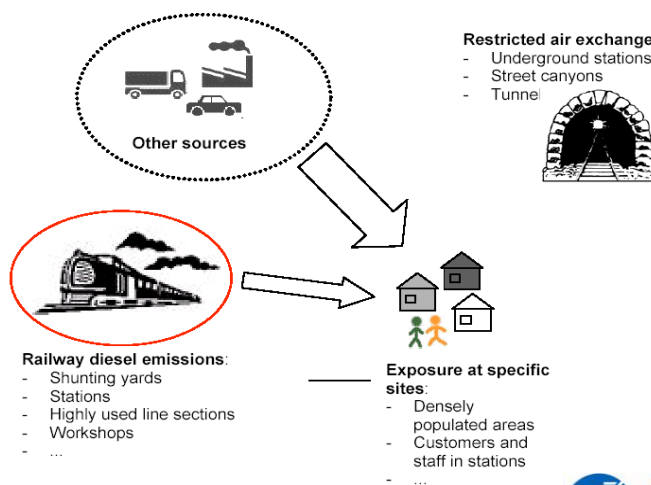
(exhaust emissions of diesel traction)

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- If a certain level of NO_x-immission is exceeded on more than a given number of days per year, the authorities have to develop and execute air quality planning (from 2010).
- NO_x and PM are the most prominent pollutants in terms of rail transport.
- PTAs may work on behalf of environmental authorities and require reduced emissions from the TOCs, but can also be addressed by environmental authorities, if their services or vehicles face restrictions.

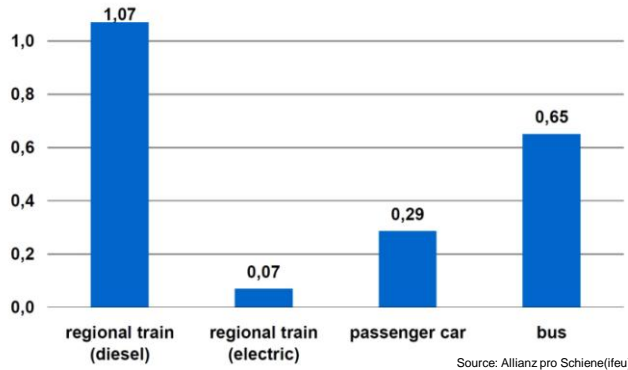
Political and environmental relevance

- CO, HC, NO_x and PM are emitted by diesel engines, i.e. in rail transport diesel locomotives and DMU.
- NO_x and PM are the most prominent pollutants in terms of rail transport.
- The pollutants mentioned above are also caused by rail transport if electric locos or EMUs use electricity from fossil fuels.
 In the ECORails context this should be discussed in connection with the use of renewable energies and the energy mix in catenary or life rail.

Political and environmental relevance



NO_x emissions in passenger transport 2008 values for Germany, NO_x in g/pkm

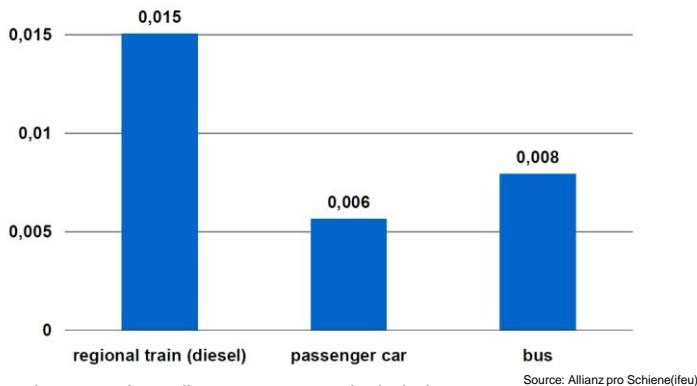


Note 1, private car: long-distance transport included

Note 2, bus: only scheduled services (regional & long-distance), no charter etc.

Political and environmental relevance

particle emissions in passenger transport 2008 values for Germany, PM2.5 in g/pkm



Note 1, private car: long-distance transport included

Note 2, bus: only scheduled services (regional & long-distance), no charter etc.

Political and environmental relevance

- As far as transport is concerned, authorities usually address road transport, but also water and rail transport may come into focus.
- PTAs may work on behalf of environmental authorities and require reduced emissions from the TOCs, but can also be addressed by environmental authorities, if their services or vehicles face restrictions.
- Specific problems in densely populated or industrialised areas with intense diesel operation; specific problems for passengers in tunnels and covered stations

EU – Nonroad – Directive 2004/26/EC, emission levels for rail vehicles

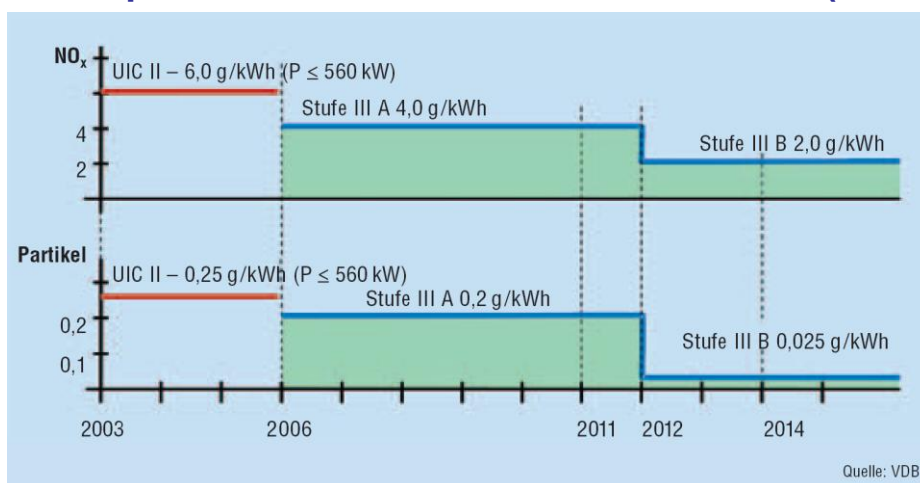
Vehicle category	Stage	CO	HC	NO _x	PM
Railcars / DMUs	IIIA (2006)	3,5	4,0		0,20
Railcars / DMUs	IIIB (2012)	3,5	0,19	2,0	0,025
Locos (130 kW < P < 560 kW)	IIIA (2007)	3,5	4,0		0,2
Locos (560 kW < P < 2.000 kW)	IIIA (2009)	3,5	0,5	6,0	0,2
Locos (P > 2.000 kW)	IIIA (2009)	3,5	0,4	7,4	0,2
Locos (P > 130 kW)	IIIB (2012)	3,5	4,0		0,025

EU – Nonroad – Directive 2004/26/EC, emission levels for rail vehicles

Vehicle category	Stage	CO	HC	NO _x	PM
Railcars / DMUs	IIIA (2006)	3,5	4,0		0,20
Railcars / DMUs	IIIB (2012)	3,5	0,19	2,0	0,025
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Locos (560 kW < P < 2.000 kW)	IIIA (2006)				0,2
Locos (P > 2.000 kW)	IIIA (2009)				0,2
Locos (P > 130 kW)	IIIB (2012)	3,5	4,0		0,025

Remotorisation is not required, but if a new engine is produced (i.e. a locomotive re-motorised), it must fulfil the limit values.

Development of norms for exhaust emissions (DMU)



Quelle: VDB

Options for the reduction of emissions: technologies

- Particle filter (DPF)
- Selective Catalytic Reduction (SCR)
- Continuously Regenerating Trap (CRT)
- Combined SCR+CRT (SCRT)

Usually increased energy consumption is caused; this effect may be balanced by other improvements.
 PTA may require retrofit, but should define target values with reference to norms.

- Exhaust Gas Recirculation (EGR)

Results in terms of pollutants and energy consumption to be considered (retrofit complicated?)

- Remotorisation

May be required or encouraged by PTA if modernisation of existing vehicles is considered.

- Alternative fuels

controversial because of ecological and economical implications

Options for the reduction of emissions: operational measures

- Electrification
- No diesel operation under wire
- Energy-efficient driving (driver training, optimisation of train configuration and timetable, etc.)
- Avoidance of idling, stand-by mode, external electricity supply
- Optimised dispatching

Concerns the relation between PTA and IM. Plans for electrification should be considered when defining contract duration for diesel operation.

PTA should require electric operation. Certain flexibility may be useful depending on circumstances.

Measures are mostly identical to measures of energy-efficient operation.
 Therefore (nearly?) no additional specification needed, but situation of pollutants could be relevant for weighting of criteria.

Some additional comments

- Stage IIIb still a problem for heavy diesel engines, esp. NO_x ?
Still open question whether NO_x value is reached with use of urea (=additional supply infrastructure) or without?
- For Stage IIIB usually DPF needed, but railcars are already in operation which fulfill IIIB without DPF, but with reduced power (Stadler RS 1 of ODEG).
- Retrofit with DPF is an option if engine and vehicle design allow.

How to choose targets?

- Targets depend on pollutant situation in the area, along the line, and for passengers.
- In order to make it easy: targets should be defined with reference to emission norms.
- Targets depend on rolling stock strategy: new/old/modernised.

Pollutants: (chapter 5.5)



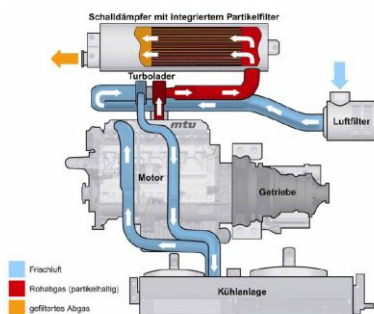
Options:

- Requiring or encouraging Stage IIIB
- Requiring or encouraging Stage IIIA
- Requiring or encouraging Stage IIIA but PM limits of IIIB
- Excluding locos and DMUs with outdated standards
- Modernisation of the fleet during the contract period
- Incentives for intensified use of better vehicles
- Maintenance quality

Practice of awarding

Rhein-Main Verkehrsverbund (RMV, German PTA) procured a series of DMU (Alstom LINT 41) with particle filters for their own vehicle pool. The additional costs were partially born by the communities which are served by the „Tanus railway“ between Friedrichsdorf and Brandoberndorf.

The DMUs fulfil Stage IIIa and the particle limits of Stage IIIB.



Source (diagram and photo): VDB, 2007

Practice of awarding

Verkehrsverbund Berlin-Brandenburg (VBB) used in its recent tender a scoring model which encouraged the use of DMUs with advanced exhaust emission standards.

The result of the 2008 decision was:

One successful bidder will use DMUs fulfilling Stage IIIa,

The other successful bidder will use DMUs with Stage IIIb.



Regio Shuttle (Stadler) : DMUs of the same basic design but upgraded for Stage IIIb will be used on the VBB network

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