



WIKI



CIVITAS Webinar - Clean buses for your city

27.02.2014

Smart choices for cities - Clean buses for your city

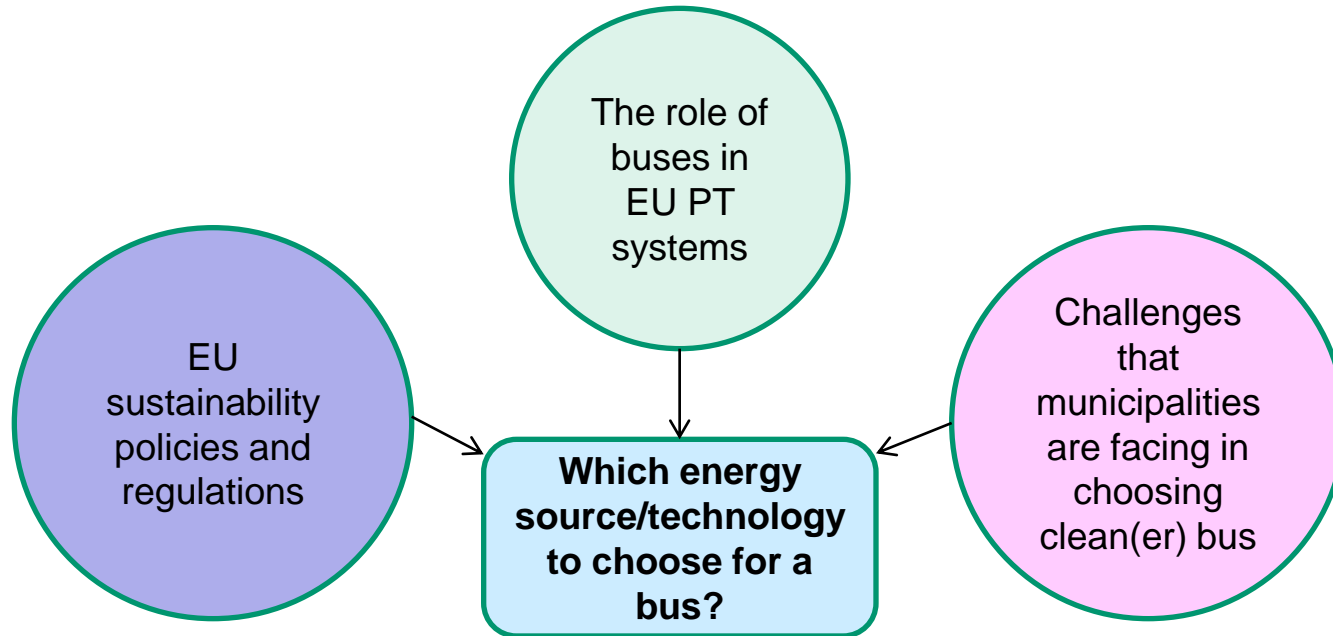
Short term and long term investment decision in the cleaner bus

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Why this topic?



The role of buses in EU public transport system

Backbone of many EU public transport systems, providing 7,8% of EU mobility in 2011

Figure 1. Distribution of age of buses in Euro-28 countries, 2011

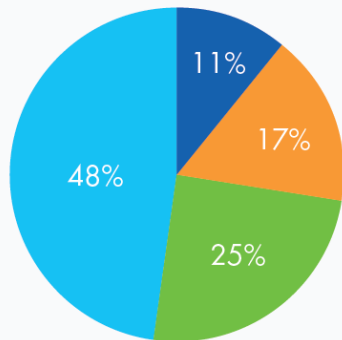
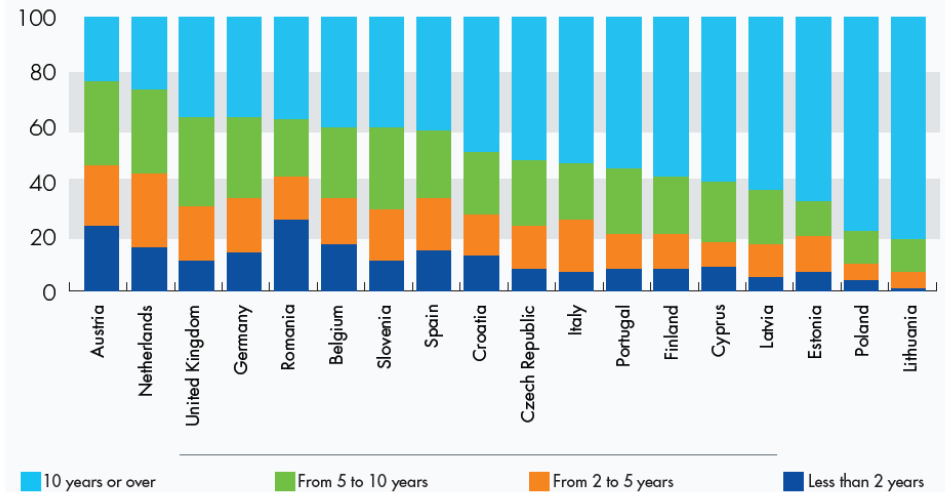


Figure 2. Distribution of age of buses in EU-28 countries in percentages, 2011



Source: Eurostat

EU sustainability policies and regulations

Four dimensions of European policy affecting public transport fleets:

- EU commitments to reduce GHG emissions: an objective of 60% emission reduction from road transport
- Public health concerns and air quality issue
- Energy security: e.g. bidding targets to all EU MS to achieve 20% of energy usage from renewables by 2020
- Legislation on noise limits

Emission level and year of enforcement		Test procedure (operating conditions)	Carbon monoxide	Hydrocarbons	Non-methane hydrocarbons	Methane	Nitrogen oxides	Particulate matter
			CO (g/kWh)	HC (g/kWh)	NMHC (g/kWh)	CH4 (g/kWh)	NOx (g/kWh)	PM (g/kWh)
Euro VI	2014	steady states, WHSC	1.5	0.13	-	-	0.4	0.01
		transient, WHTC	4	-	0.16	0.5	0.46	0.01
Euro V	2008	steady states, ESC	1.5	0.46	-	-	2	0.02
		transient, ETC	4	-	0.55	1.1	2	0.03

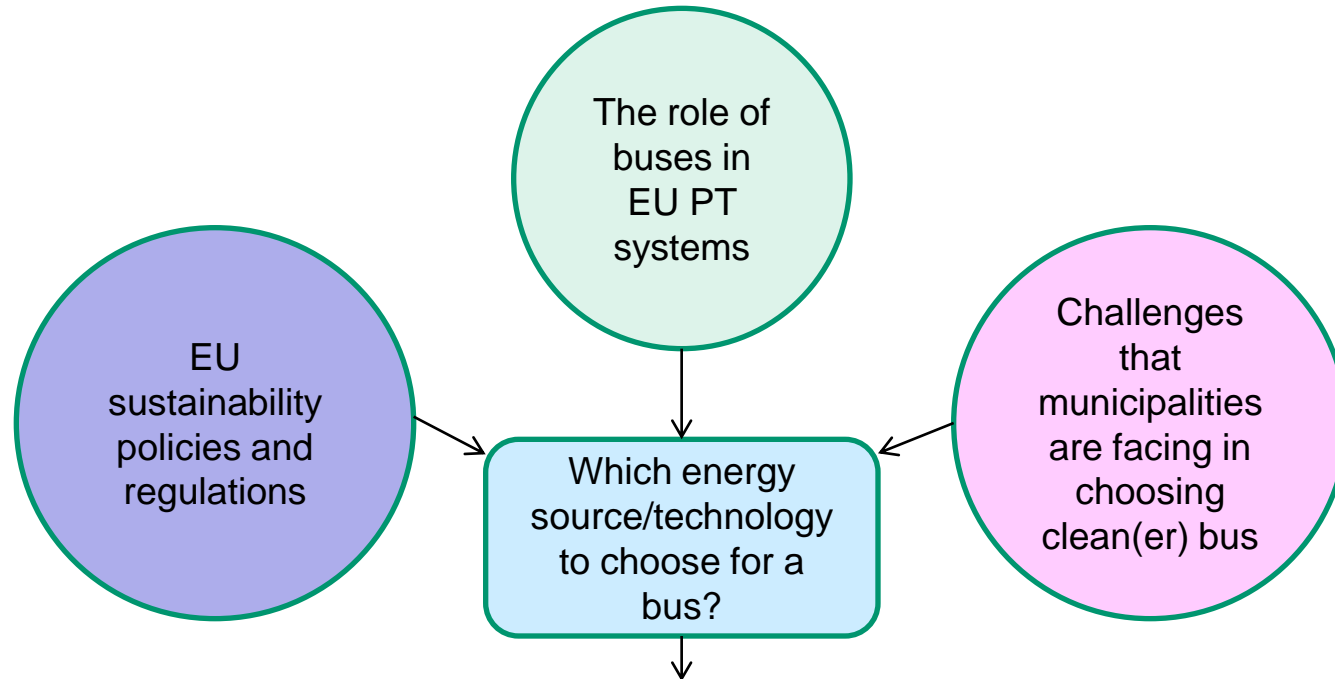
Challenges in introducing clean buses



- Lack of information
- Difficulty to make the most cost-efficient solution: the newest versus second-hand options?
- Additional infrastructure
- Innovation cycle versus life cycle of buses



Why this topic?



CIVITAS WIKI Policy Note “Clean Buses for your city”

- What are the options available and which energy source/technology to choose for a bus?
- What are the advantages/disadvantages of different options?
- What are the costs of these options?
- Which fuels require installation of additional infrastructure and what are associated to it costs?

What are the clean(er) bus options?

Buses bought today, contribute directly to the achievement of EU 2020 and 2050 targets

Energy carrier	Possible and most promising “clean(er)” bus technologies
Fossil fuels	<ul style="list-style-type: none"> • Diesel → EURO VI • Natural gas → CNG → LNG • Liquid petroleum gas
Biofuels	<ul style="list-style-type: none"> • Biodiesel → 1st generation: FAME → 2nd generation: HVO • Bioethanol • Bio methane / Landfill liquefied methane
Electricity	<ul style="list-style-type: none"> • Electric buses • Trolley buses
Hydrogen	<ul style="list-style-type: none"> • Full cell without battery • Hydrogen internal combustion • Hybrid hydrogen/electricity
Hybrid	<ul style="list-style-type: none"> • Parallel ICE/electricity hybrid • Serial hybrid configuration with dominating electricity

Municipality perspective:

- Euro VI, VI diesel buses, diesel hybrid/electric buses and buses running on biofuels

EU perspective:

EU 2020 targets: 10% biofuels content, 6% GHG reduction of conventional fuels, 20% GHG emission reduction

- High blends of first or second generation biodiesel - to increase the renewable energy share above the blending limit
- Biogas (in CNG buses) - to increase the renewable share (up to 100%)
- Hybrid drivelines with diesel or gas engines - to further reduce GHG emissions by about 20%.

Municipality perspective:

- Technologies with lowest (well to wheel) energy consumption and good possibilities for using renewable fuels (e.g. electric buses, trolleybuses, hydrogen fuel cell buses)

EU perspective:

EU 2050 targets: 60% reduction of GHG emissions from transport

- Full electric buses – with clean(er) electricity supply and cheaper bus battery
- Hydrogen buses – with production of hydrogen in a renewable way with solar and wind energy

Conclusion



If financial resources allow, municipalities and public transport operators should aim for the zero-emissions or closest to it options. Otherwise, especially within current conditions of economic and financial crises conventional diesel buses (Euro VI) and their hybrid configurations represent a very good environmentally friendly option as well.

