

# 1<sup>st</sup> International Workshop to Push Forward Your Trolleybus System

## Session 1: Management of Costs and Financing

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**TrolleyMotion**

**VÖV UTP**



*Presentation*

Salzburg, Austria  
20 April 2006

# Management of Costs and Financing

## Contents:

- General overview of financing regimes/principles
- Cost structures and mechanisms
- Differences between Trolley and Diesel-bus
- Cost modelling and simulation
- Summary and conclusion

### Contents

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20 April 2006*

# General overview of financing principles/regimes

## ■ Subsidies from General Tax Revenues

- most common form of financing public transport infrastructure
- Germany: part of tax imposed on gasoline and oil products (in 2002 about 4%, 1,7 billion €), financing of up to 65% of investments, complementary subsidies from local governments
- Japan: "Railway Development Fund" since 1972, financing of about 36% of construction costs for railway infrastructure; central and local governments also provide a subsidy by reimbursing interest payments above 5% p.a.

## ■ Subsidies from earmarked Taxes

- dedicated to investments into public transport infrastructure and to finance operating costs
- Norway: money from toll systems for investments
- France: "Versement Transport" as a special charge on salaries (between 1% and 2,2%); imposition and assignment is managed locally



# General overview of financing principles/regimes

- **Value Capturing, absorption of enhancement in value**
  - financial contribution of beneficiaries of public transport (particularly by increase of property value)
  - Hongkong: extension of metro line 4
  - prerequisites are difficult to establish: identification of real beneficiaries, calculation of real enhancement in value, legal and administrative framework
- **Government property tax revenues for companies**
  - Seoul: traffic tax on owners of commercial entities that generate excessive commuting traffic
  - Kobe: developers of land in station areas have to bear part of rail construction costs and to allocate land for rail use
  - Tokyo: property owners share the costs for walkways connecting stations to nearby buildings

# General overview of financing principles/regimes

## ■ Involvement of private investors (PPP)

- London: reinvestment and operations of metro infrastructure for 30 years by private consortia
- Rostock: BOT-model for Warnow-tunnel
- appropriate risk-sharing is essential for successful PPP-models



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# Aim: To objectify the discussions on the most cost effective bus-mode

- Comparison of cost structure and mechanisms of trolleybus versus diesel-bus systems
- Based on experiences from project work and real figures
  - typically mixed systems (trolley- and diesel-bus)
  - data from Austria, Germany and Switzerland
  - in-depth analysis of cost and performance in order to
    - identify cost saving potentials
    - initiate restructuring processes
    - elaborate business strategies
    - carry out due diligences for M&A-processes
    - certify public subsidies as legally allowed

 Cost model was developed

- to evaluate economic effectiveness
- to indicate differences between bus-modes

# Costs are structured along the value chain

<p><b>Driver</b> driver costs training, education service clothing</p>	<p><b>Customer Management</b> marketing &amp; sales ticket inspection information &amp; safety</p>	<b>internal labour</b>
<p><b>Traffic Management</b> operational management, planning, driving school , ... depot management, disposition traffic control</p>	<p><b>Overhead</b> commercial processes human resources management processes ...</p>	
<p><b>Infrastructure</b> stations power supply &amp; catenaries buildings and depots</p>	<p><b>Vehicles/Buses</b> capital cost (depreciation, interest) traction energy/diesel, lubricants maintenance &amp; daily services</p>	
<p><b>Management of subcontracted Driving Services</b> subcontractor cost superior management of traffic</p>		<b>external labour</b>

## Cost structures and mechanisms

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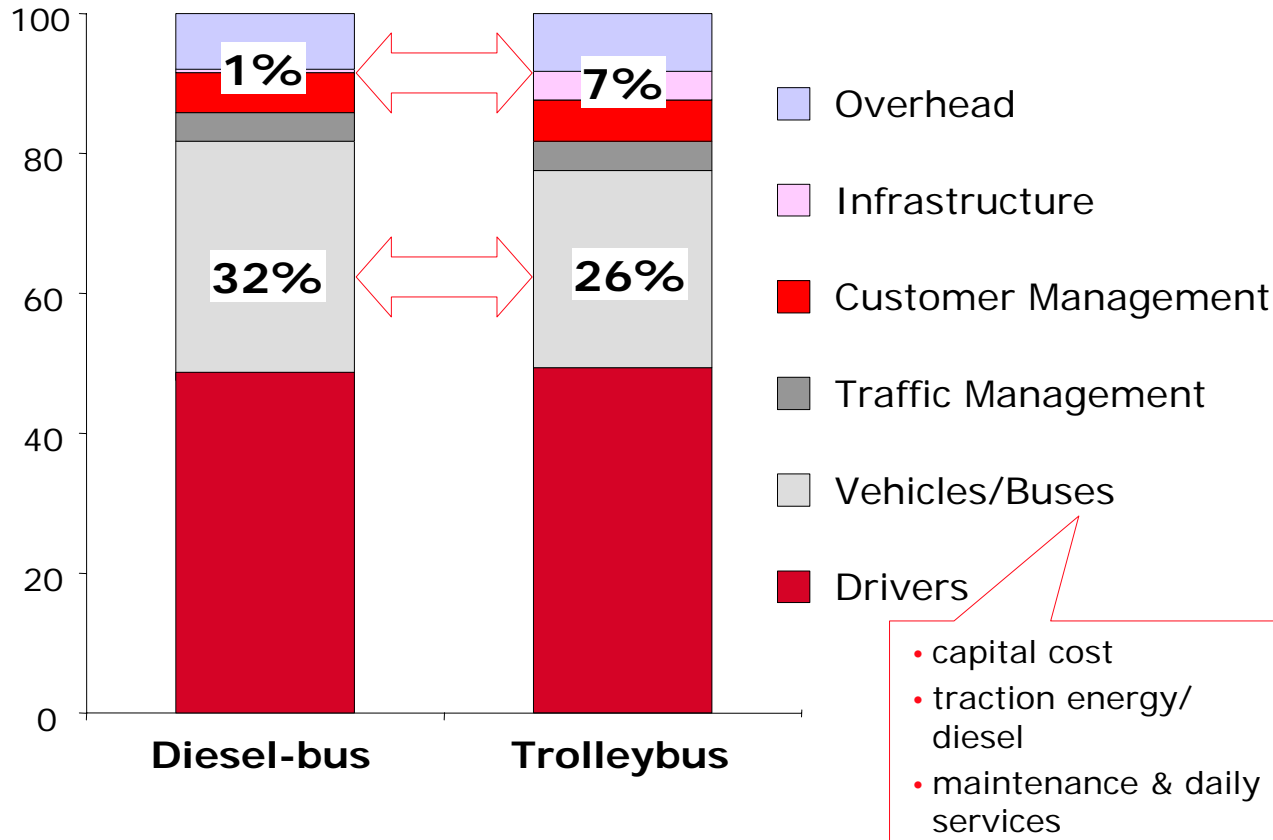
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# While most of cost elements are equal, some differ substantially

Total cost index = 100%



## Cost structures and mechanisms



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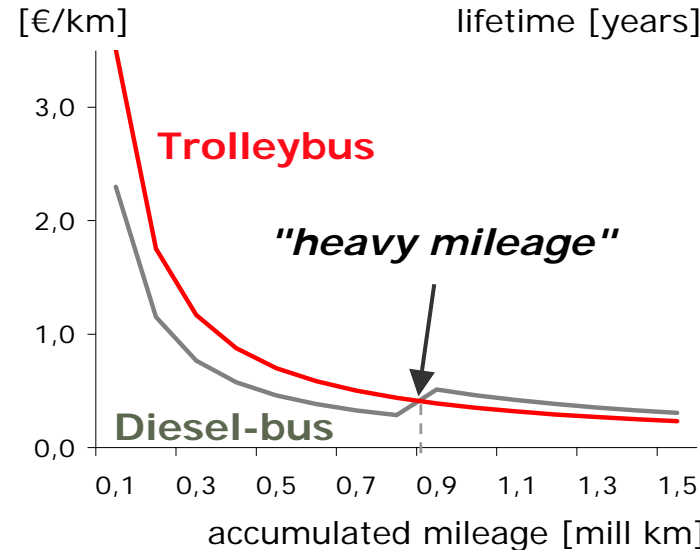
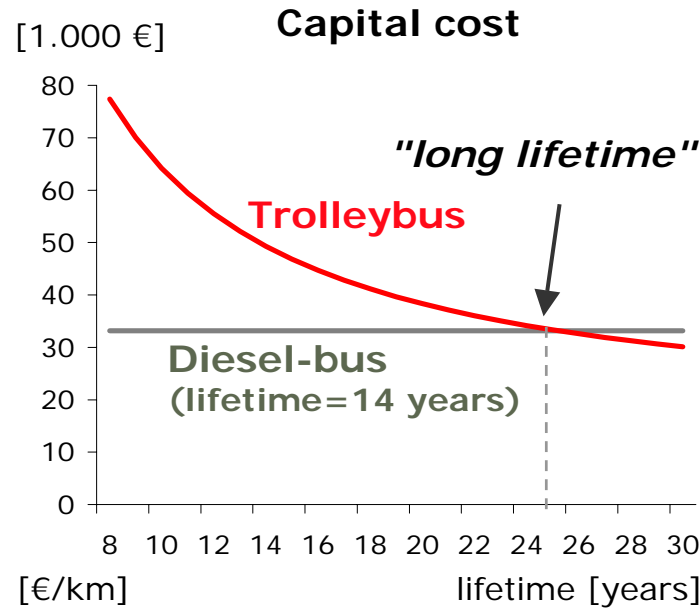
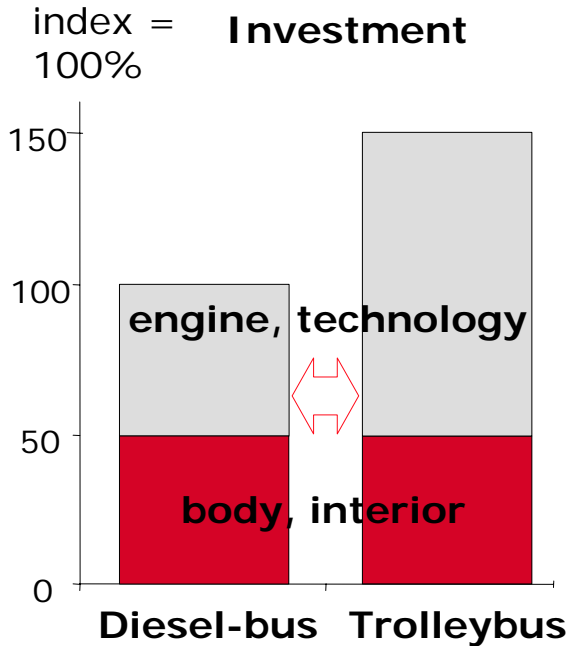
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- ➔ detailed analysis of different cost elements
- ➔ evaluation of trade-offs

# Trolleybuses should be used intensively in order to gain economic advantages

## Capital cost of vehicles



### Cost structures and mechanisms



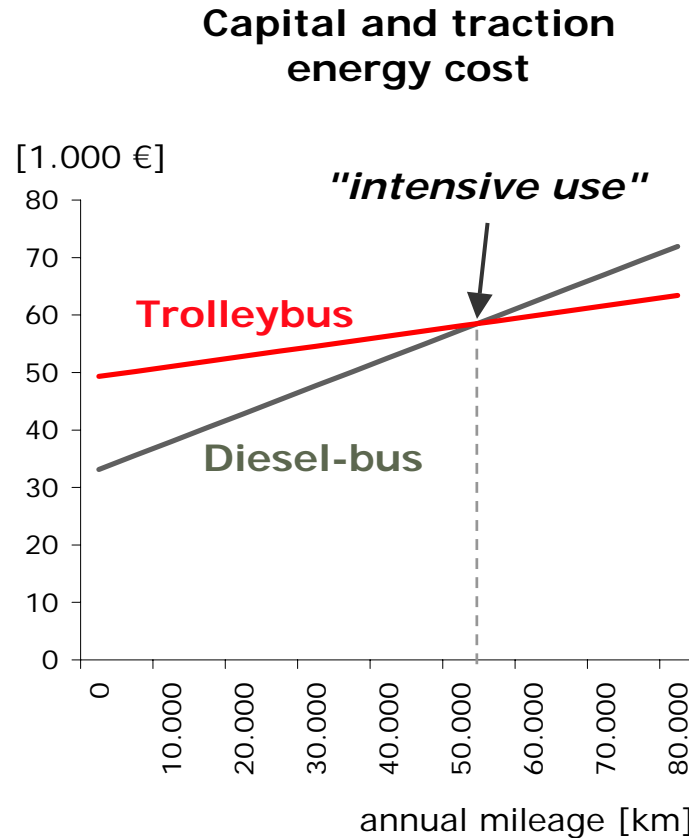
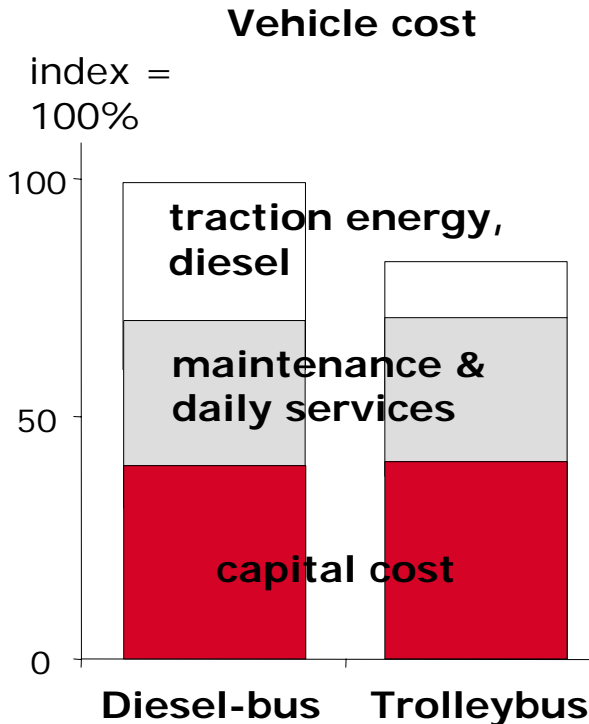
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# Depending on lifetimes trade-offs within vehicle cost are positive for trolleybuses

## Vehicle cost - comparison



## Cost structures and mechanisms



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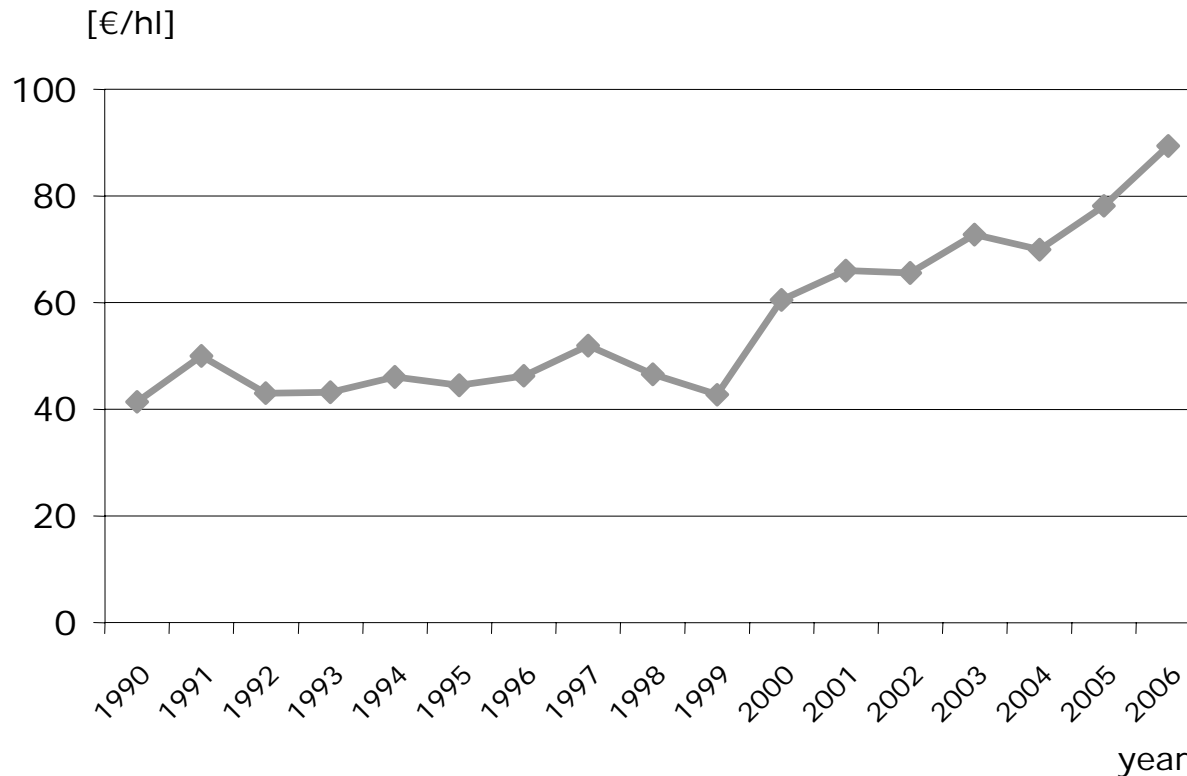
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- ➔ the more intensive the use of trolleybuses the cheaper they are
- ➔ advantage in traction energy dominates above threshold of approx. 55.000 km p.a.

# Trolleybus systems profit from strong development of diesel-price

## Diesel-price development



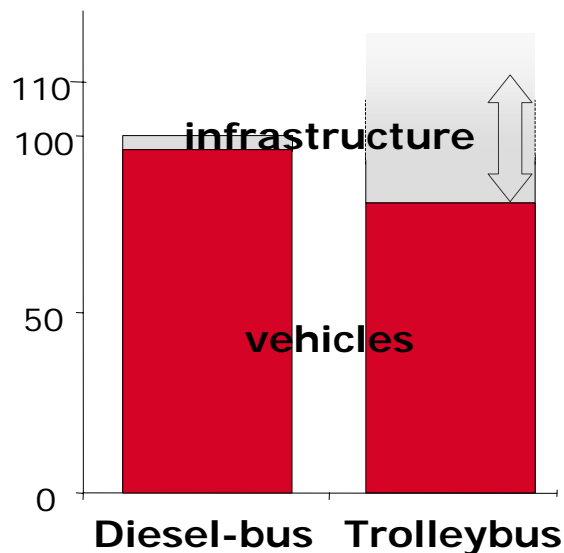
- ➔ the higher the diesel-price the better economic situation for trolleybuses
- ➔ decreasing of diesel-price can not be expected in future

# Infrastructure investment has to be justified by intensive use, also

<b>Trolleybus infrastructure</b>	<b>Initial investment</b>	<b>Total annual cost</b>	<b>Share of capital</b>
<b>overhead contact wire system</b>	<b>250 K€ p. km</b>	<b>17,0 K€ p. km</b>	<b>78%</b>
<b>substation</b>	<b>430 K€ p.unit</b>	<b>23,6 K€ p. unit</b>	<b>82%</b>

## Cost structures and mechanisms

index = 100%



➔ infrastructure = predominantly fixed costs

➔ vehicle and infrastructure costs are strongly correlated with the utilisation of the system



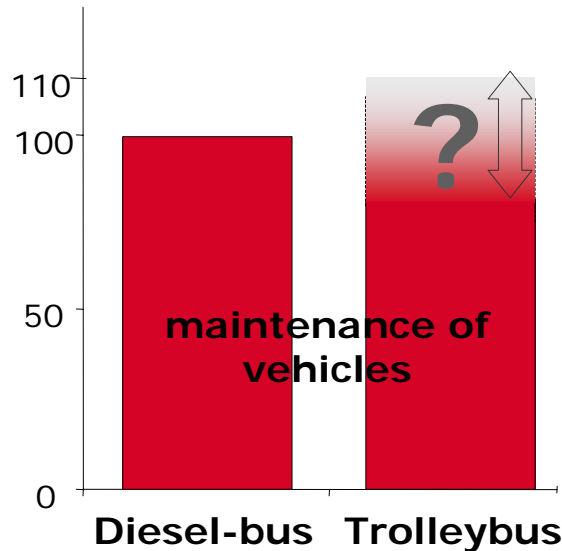
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# For vehicle maintenance the situation is still not clear

index =  
100%



- ➔ specialized work forces for trolley-buses needed
- ➔ since less than 100% of maintenance work depends on utilisation, intensive use of buses is meaningful

- According to an old script of VDV (881-1) the trolleybus needs more maintenance attention than a diesel-bus
- Looking at the robust traction technology of trolleybuses this may amaze some
- Real project data draws no clear picture between diesel- and trolleybus

Cost structures and mechanisms

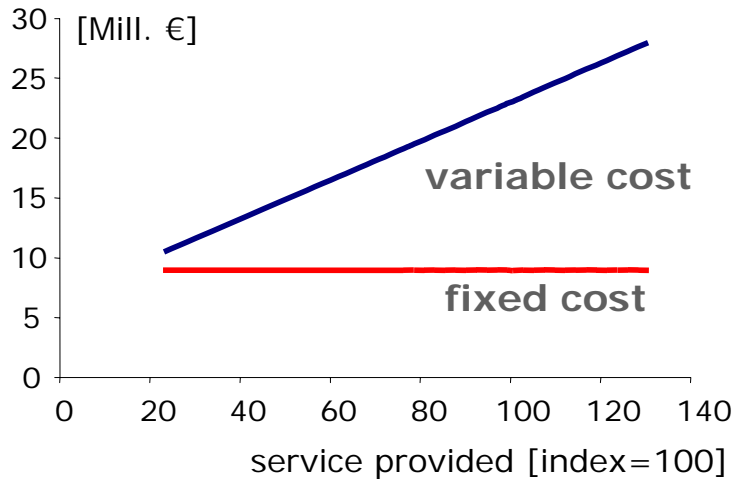


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# Looking at the cost mechanisms the do's and don'ts are becoming obvious



- trolleybus with higher proportion of fixed costs than diesel-bus
- hence, stronger effect on fixed cost if services are increased
- in case of tight schedules and short headways, a trolley-bus can realise its advantages
- particularly with regard to fuel prices the economic situation gets better for trolleybuses

## Cost structures and mechanisms

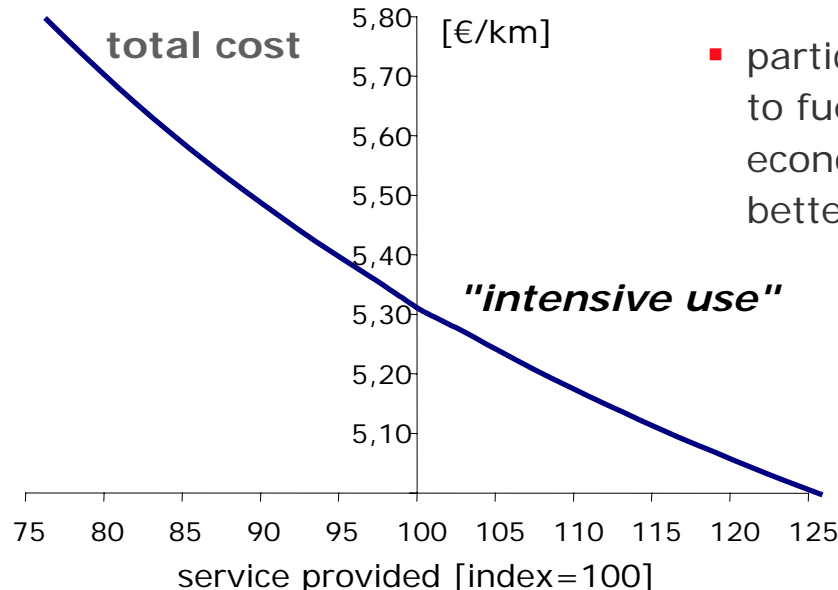
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- Trolleybus systems are not necessarily more expensive than diesel-bus systems
- A high utilisation in terms of services provided is essential for competitive unit cost (€/km)
- By this the high proportion of fixed costs due to capital costs of vehicles and infrastructure is distributed
- Cost advantage of a trolleybus system appears in traction energy in particular
- This will continue to be an advantage in future if diesel-prices are increasing further
- From ecological point of view the trolleybus is the clear favourite
- Additionally experiences show that trolleybus systems generate more revenues due to higher ridership ("railway-bonus")

## Summary and conclusion

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If you have any questions or if you would like  
to receive further information, please do not  
hesitate to contact us.



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