

Promoting **clean** public transport

# Trolley

## TROLLEY Roadmap - Operator perspective on ebus future



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map by © (2010) data2map.at

# Involved Stakeholders

- Salzburg AG, AT
- PKT Gdynia, PL
- RATB Bucarest, RO
- PMDP Plzno, CZ
- SZKT Szeged, HU
- TEP Parma, IT
- LVB Leipzig, DE



# TROLLEY Roadmap – Operator perspective

- ▶ Electromobility with passenger cars develops substantially slower than expected

*Handelsblatt, 24.2.2013: „Warum das E-Auto nicht zündet“:*

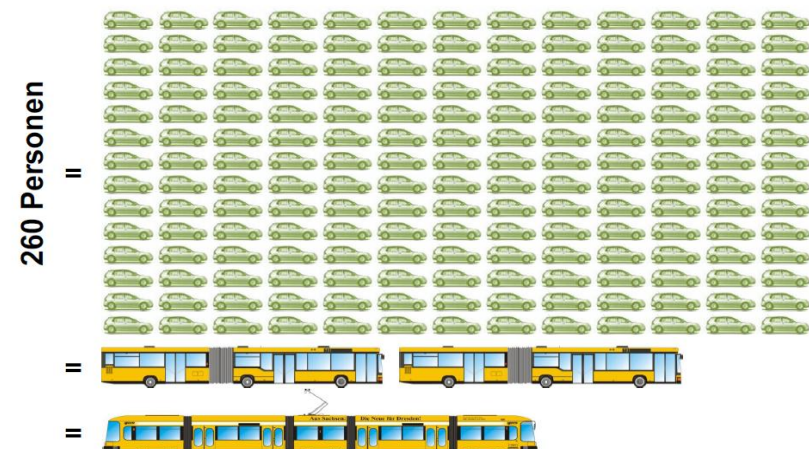
"44 Opel Ampera were sold during one month, ..."

„One million electric passenger cars in Germany by 2020 – scarcely anybody in the automotive branch still believes in reaching this set target of the (German) federal government."

„The electromobility hype has noticeably moved backwards."

- ▶ **1:1 Substitution of electric passenger cars won't solve the intra-urban traffic problems**

(Noise, particulate matter, emissions, limited space, increase in 2nd or 3rd car etc.)



Source: Prof Stephan, TU Dresden

## Greatest potential for further development of propulsion modes for public transport vehicles by 2020/2050?

- Operators need **ready-to-use transport technology for electromobility**; trolleybuses are a proven and stable electro-mobility solution for urban areas
- Electromobility with euses **reduces noise exposure, particulate matter and vehicle exhaust emissions**; Salzburg saves approx. 60.000 tons of CO2/year
- Trolleybus systems are **building the bridge towards full electric public transport systems**





## Greatest potential for further development of propulsion modes for public transport vehicles by 2020/2050?

- Which type of traffic is suitable for which type of electric PT (with ebus)? - Different ebus systems for different areas of operations, but at present for a medium-sized city like Salzburg:



- Battery buses do not achieve the required distance of 200-500 km/day



- Hybrid buses are not competitive without funding (case studies from Germany)

# TROLLEY Roadmap – Operator perspective

## Greatest potential for further development of propulsion modes for public transport vehicles by 2020/2050?

- Which type of traffic is suitable for which type of electric PT (with ebus)? - different ebus systems for different areas of operations, but at present for a medium-sized city like Salzburg:



- No adequate infrastructure for fuel cell buses; insufficient energy balance



- Inductive ebus systems are too costly (due to construction cost); so far isolated application

# TROLLEY Roadmap – Operator perspective

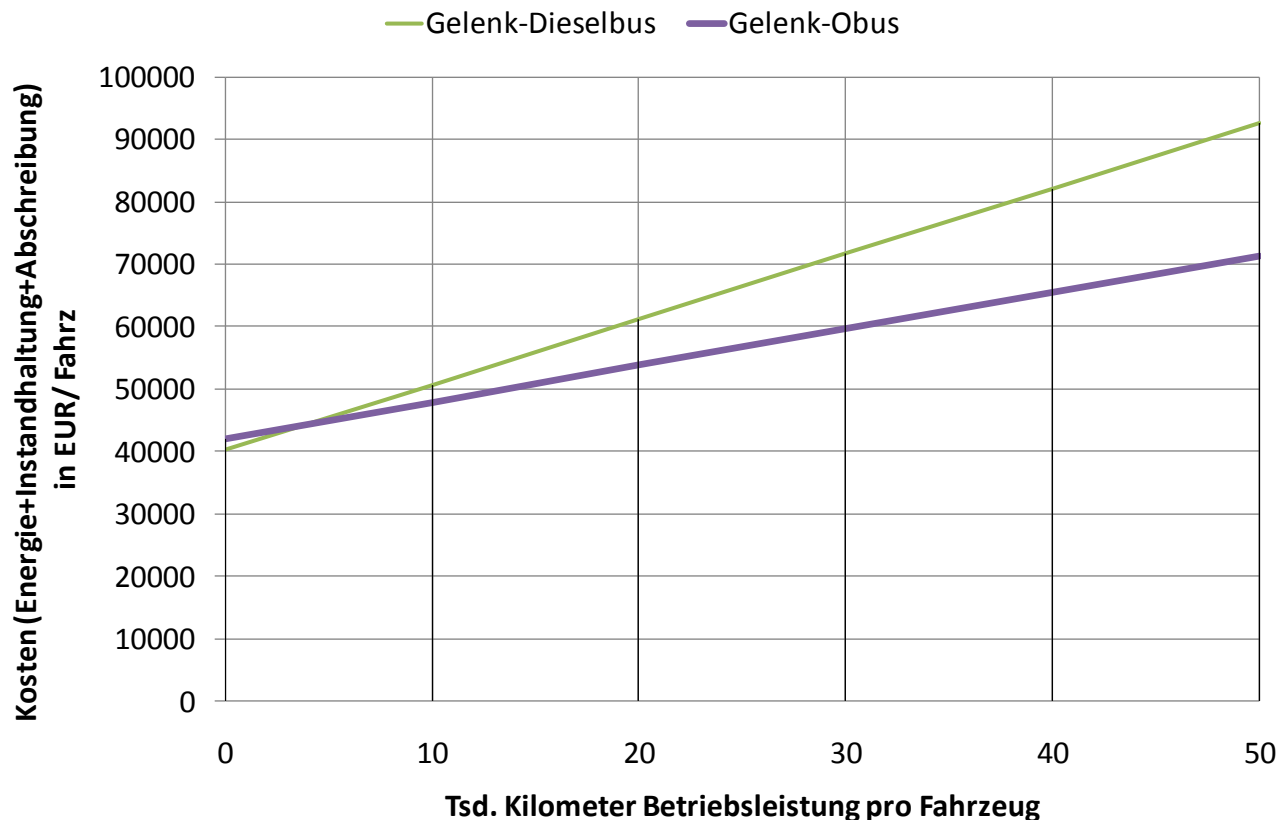
**Trolleybus systems are economical:** feasibility study  
Eberswalde -1 cent per scheduled km more expensive than diesel bus system

	Trolleybus	Diesel bus
Energy/fuel	264.000 €	442.600 €
Staff costs/driver	No difference	
Maintenance vehicle	80.000 €	72.000 €
Staff costs/garage	No difference	
Staff costs/cat.	126.000 €	---
Maintenance/cat.	19.000 €	---
Insurance vehicle	48.000 €	24.000 €
Investment/Recovery time	37.800 € 18 years	31.000 € 10 years
Difference	+5.200 €	
Difference/km	0,01 €	

**Savings of 95% CO2 emissions**  
(based on green power mix)  
compared to diesel bus system

# TROLLEY Roadmap – Operator perspective

## Trolleybus systems are economical: feasibility study for agglomeration Salzburg



Above approx. 4000 operational kilometres, the cost-effectiveness of the trolleybus is better than the cost-effectiveness of the diesel bus in Salzburg.



# TROLLEY Roadmap – Operator perspective

## Trends and biggest impact on the electrification of urban mobility in EU cities / what political action would be required?

- Raising oil prices and the transport dilemma of increasing urban sprawl; need for urban mobility vs. traffic-induced pollution
- Preferential treatment of PT vs. individual transport (green city centers); regulatory consideration of sustainability goals in PT
- Regulatory framework for the development of ebus systems in EU (e.g. common regulatory definition, tram or trolleybus legislation)
- Need for infrastructure funding and incentives schemes for ebus take-up



# TROLLEY Roadmap – Operator perspective

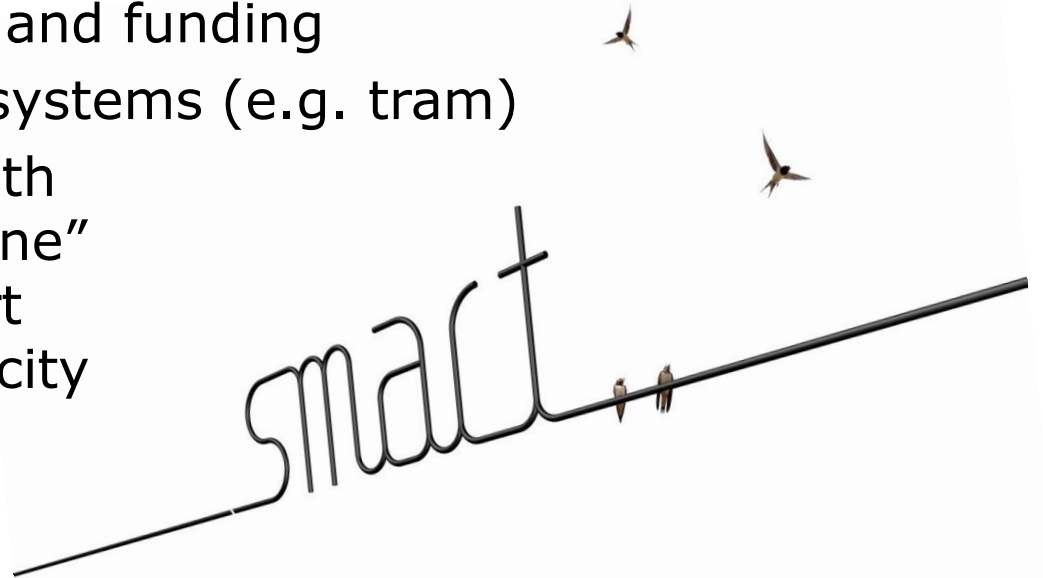
## Game-changing technologies and scientific challenges for electric public transport in European cities of the next two decades?

- Long term perspective: research & development of batteries as complementary element
- Energy management systems (new interface (re)charging systems, recuperation of braking energy, smart grid, bus station of the future (with local renewable energy source)
- Development of high –capacity euses with a length of 30m plus; comparable capacities with tram systems



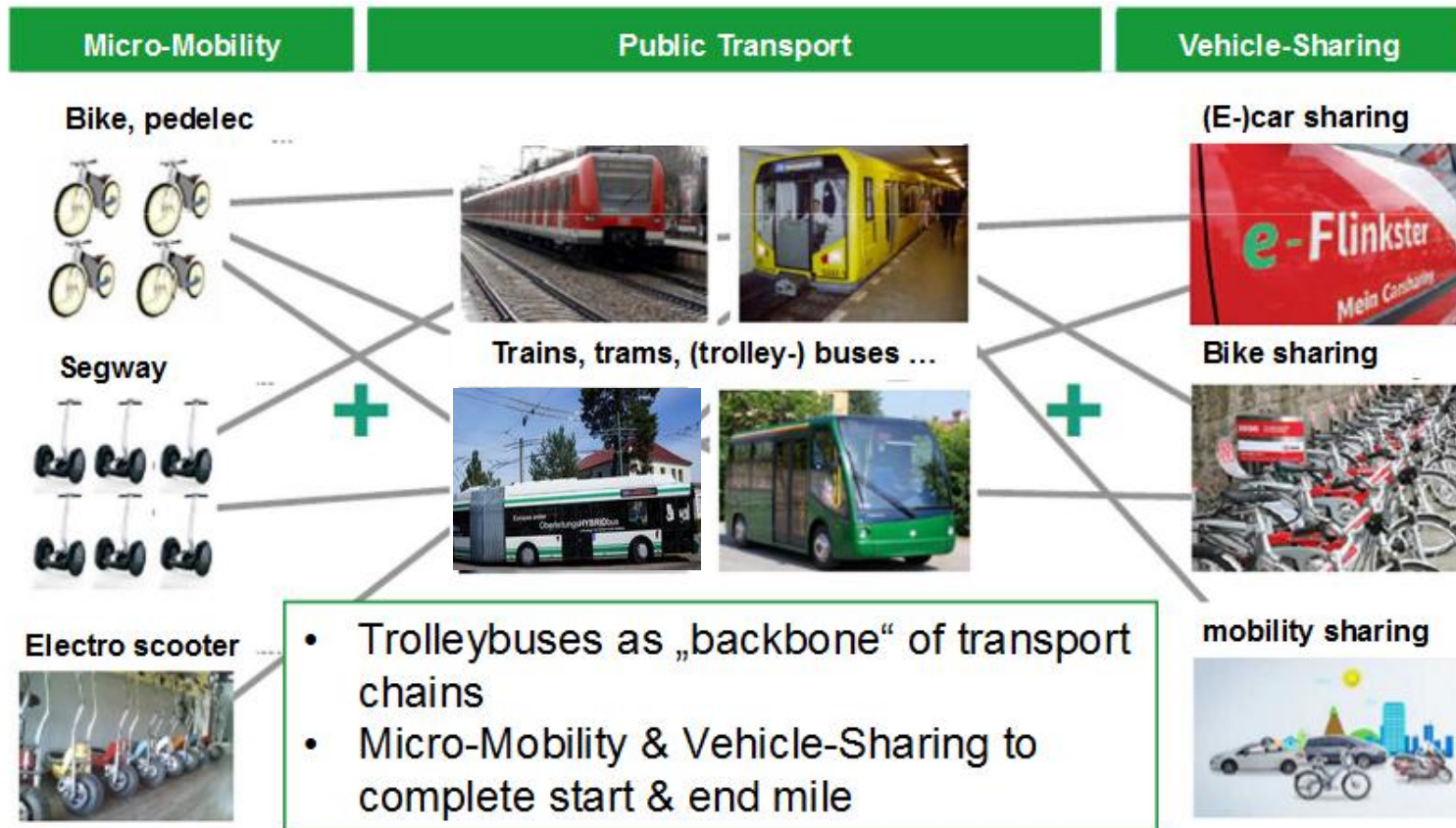
## Promising strategies and business models to boost the introduction of electric public transport in future European smart cities?

- Life-cycle approach for environmental assessment of PT solutions (incl. energy source consideration) as precondition for start-up investment and funding
- Use synergies of other systems (e.g. tram)
- Intermodal approach with trolleybuses as “backbone” of an (electric) transport chain in a future smart city



# TROLLEY Roadmap – Operator perspective

## Promising strategies and business models to boost the introduction of electric public transport



Source: Speth, IAO, 2011



## Promising strategies and business models to boost the introduction of electric public transport in future European smart cities?

- Development of new, and adaption of existing, staff training of PT operators for driving/maintenance of electric buses; e.g. the Intelligent Energy Europe project, ACTUATE (safe eco-driving of clean vehicles)
- Between 5 to 10% energy savings due to optimised driving behaviour of trolleybuses in Salzburg





## Future catenary network for trolleybus systems and auxiliary engines in trolleybuses by 2020/2050?

- Partial networks with flexible wiring and de-wiring (while driving)
- Highly frequented PT axes will remain under the catenary (trams or trolleybuses) due to optimised energy efficiency with flexible ebus solutions for less frequented urban districts
- Auxiliary engines could be fully electric across Europe in 2020!
- Trolleybuses as a bridging technology towards pure ebus solutions!



# TROLLEY Roadmap – Operator perspective

## Main factors that increase attractiveness of trolleybus systems and ground breaking technologies needed for further development?

- Financial instruments: tax preferences, financing schemes (based on life cycle approach)
- Need for high priority bus lanes/corridors, especially in bigger cities to increase capacity of trolleybus systems
- System approach (incl. bus stops etc.) and new designs



Left:  
Tbus  
Group,  
UK



Right:  
Viseon  
trolley-  
bus for  
Riad

# TROLLEY Roadmap – Operator perspective

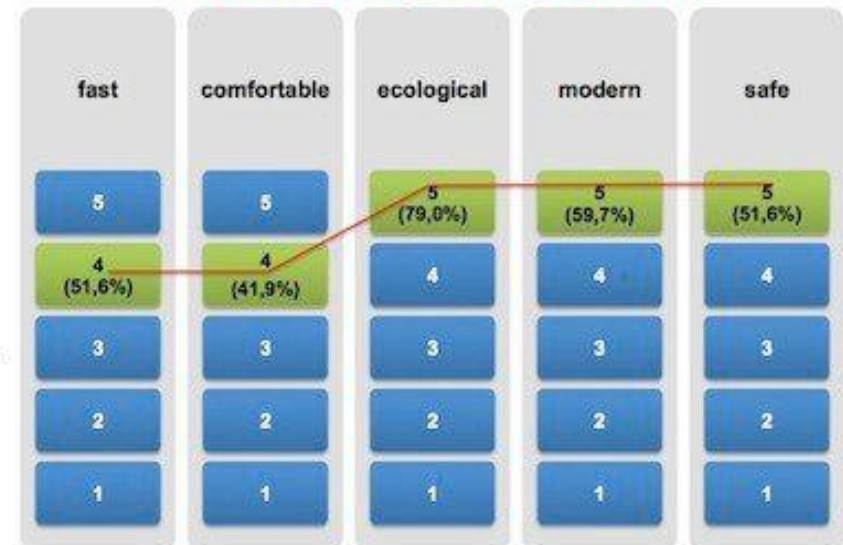
## Customers` perception:

- After introduction of new trolleybuses (incl. Europe's first Trolleybus-Battery-Hybrid)
- TROLLEY promotion activities, e.g. European Trolleybus Day

**EBERSWALDE**  
semantic profile 2011



**EBERSWALDE**  
semantic profile 2013





# Thank you for your attention!

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