

Promoting **clean** public transport

# Trolley

## TROLLEY Roadmap – Trolleybus Innovation and Research Agenda

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# 25 Involved Stakeholders

## **PT Operators & City Authorities:**

- ▶ Salzburg AG, AT
- ▶ PKT Gdynia, PL
- ▶ RATB Bucarest, RO
- ▶ PMDP Plzno, CZ
- ▶ SZKT Szeged, HU
- ▶ TEP Parma, IT
- ▶ LVB Leipzig, DE
- ▶ Leeds New Generation Transport (NGT)
- ▶ City of Gdynia
- ▶ S.M.P.T: Parma
- ▶ BKK Centre for Budapest Transport

## **Industry:**

- ▶ Kummler+Matter AG, CH
- ▶ Carrosserie HESS AG, CH
- ▶ Solaris Bus & Coach, PL
- ▶ Vossloh-Kiepe, DE
- ▶ Cegelec a.s., CZ
- ▶ POWERLINES Group, AT
- ▶ Kirsch GmbH Trier, DE

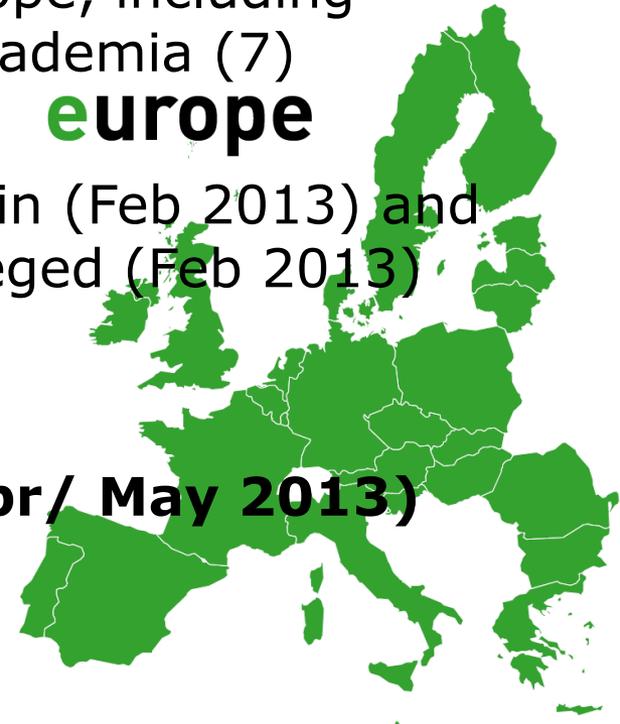
## **Research/Consultancy Institutes**

- ▶ Metropolitan Research Institute, HU
- ▶ Technical University Dresden, DE
- ▶ Warsaw School of Economics, PL
- ▶ Lviv Polytechnic National University, UA
- ▶ National Energy Conservation Agency, PL
- ▶ Trivector Traffic, SE
- ▶ S2A Consulting, CH

## Phase 2 (Jan 2013 – May 2013):

- TROLLEY adds a "capitalization activity" (strategic label of the CE Programme)
- Interviews with 25 stakeholders across Europe, including industry (7), authorities/ operators (11), academia (7)
- Verification & discussion at
  - Round tables in Vienna (Feb 2013), Berlin (Feb 2013) and Gdynia (March 2013); conference in Szeged (Feb 2013)
  - **Workshop today**
- **Research and Innovation Roadmap**
  - **Review and exchange with UITP (Apr/ May 2013)**
  - **Final version (May 2013)**

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# The next generation "e-bus"

- ▶ **smart vehicle**: silent, emission-free (well-to-wheel), comfortable, energy & cost-effective
- ▶ Fulfilling **EBSF** standards
- ▶ Rational and context-aware **combination** of:
  - ▶ Flexible **energy supply & charging** concepts (grid-based, contactless, autonomous)
  - ▶ Intelligent **energy storage** (batteries, supercaps, hydrogen/fuel cell, network, other)
- ▶ Integral part of an intelligent **energy network**
- ▶ Contributing significantly to a **sustainable city**
  - ▶ EU policy goals (White Paper, "smart cities")
  - ▶ Cost-effective provision of personal mobility
- ▶ Building on **existing know-how**:
  - ▶ Today (almost all) e-buses are trolleybuses!



# Trolleybus Innovation and Research Agenda

**Exploit the high potential of advanced trolleybus systems** to support the implementation of European transport policy:

**R&D and demonstration to:**

- develop, test and evaluate **advanced hybrid electric-electric drive train concepts** combining wire-based and autonomous modes of operation:
  - smart **combinations of trolley technology, batteries, supercapacitors**)
  - adapted to different operating conditions (climate, geography, etc.)
- develop, test and evaluate **innovative energy storage and charging systems** (contact and contact-less), combining vehicle-based with infrastructure-based **energy management**



# Trolleybus Innovation and Research Agenda

## R&D and demonstration to:

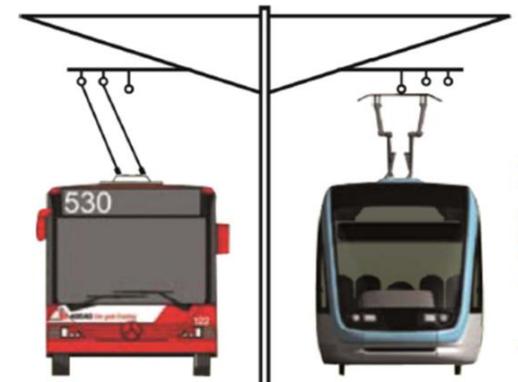
- develop, test and evaluate **smart infrastructure concepts**, exploiting synergies between
  - trolley/ tram electrical infrastructure
  - smart grids and the wider urban electromobility infrastructure (incl. smart well-to-wheel concepts, use of locally produced renewable energy)
- develop and test **automatic wiring/ de-wiring technology** permitting flexible and efficient operation in wired and autonomous mode.



# Trolleybus Innovation and Research Agenda

## Demonstration to:

- demonstrate and evaluate **integrated operational concepts** combining advanced vehicle technologies and innovative infrastructure with new operational concepts:
  - Trolleybus designed as a **Bus Rapid Transit System**
  - **Shared tram-trolley operation**
  - Comprehensive “**smart electric mobility concepts**” actively exploiting synergies for all modes
  - **Extension** from mobility-based solutions **towards wider “smart city” concepts.**
- including **evaluation** of costs and benefits; energy efficiency assessment (**well-to-wheel, life-cycle- assessment, external costs**).



Source: Prof. Müller-Hellmann

# Trolleybus Innovation and Research Agenda

**Support** for transfer, take-up, experience exchange and learning to:

- foster **interdisciplinary research activities** with integration of electromobility in Sustainable Urban Mobility Planning (SUMP)
- develop **life-cycle assessment approaches/tools** (incl. environmental assessment and energy source methods) necessary for comparability of (electric) PT solutions (integration into EU's **Clean Vehicle Directive**)
- develop **comprehensive business models** for PT systems and funding schemes (e.g. Public-Private Partnership; start-up incentives)



# Trolleybus Innovation and Research Agenda

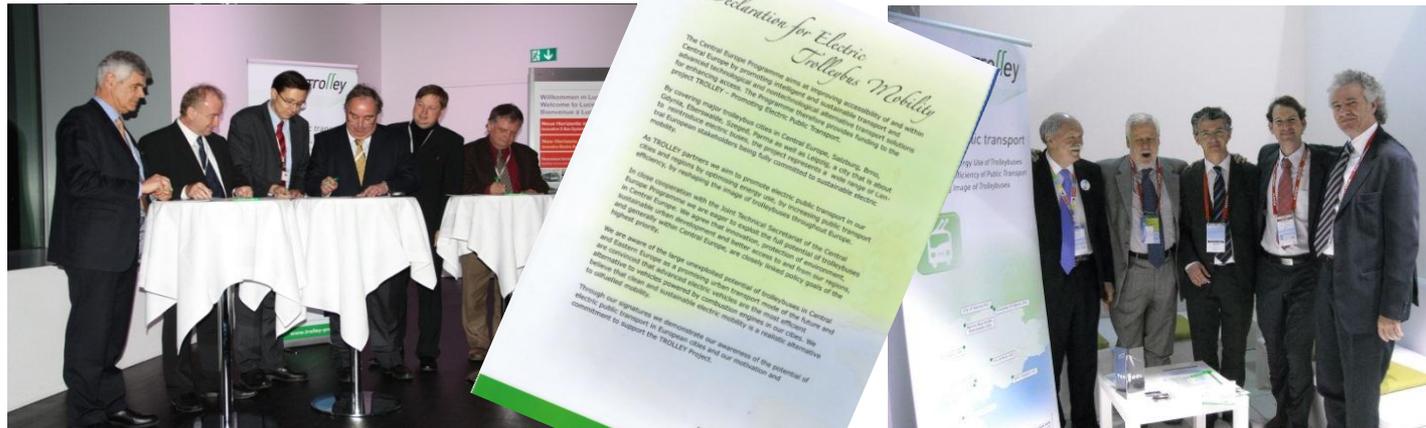
**Support** for transfer, take-up, experience exchange and learning to:

- develop new and adapt existing **staff training** for/of PT operators for **driving/maintenance of electric buses**
- develop **open standards** to prevent “lock-in solutions” and as precondition for public funding and market uptake
- develop a **regulatory framework** for the development of ebus systems in EU (e.g. common regulatory definition, tram or trolleybus legislation)
- set-up a „**Center of Excellence**“ for **European ebus solutions** for expert exchange, joint research (**incl. trolleybus stakeholders!**)



## Declaration for Electric Trolleybus Mobility

- ▶ **70 declaration signatories** from city authorities, public transport operators, industry and research have **demonstrated their commitment towards trolleybuses!**
- ▶ All signatories are published on the TROLLEY website as supporters of the trolleybus idea (upon consent)
- ▶ In case you would like to support us and sign the Declaration, please contact the TROLLEY project manager and get a template



# Thank you for your attention!

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