Clean Buses?
Great Interest from Urban Mobility Actors

European Current fleet composition

- **79%** Diesel
- **9.9%** Biodiesel
- **7%** CNG
- **0.6%** Biogas
- **1.2%** Electricity
- **2.3%** Other

*Bus fleet breakdown per fuel or energy used*

Energy Transition Operators & Authorities

- **69.7%** More hybrids
- **45.5%** Electricity
- **33.3%** More fully electric with batteries
- **12.5%** More plug-in hybrids
- **10.9%** More fully electric trolley
- **3%** More fuel cells

Respondents distribution according to future plans to change propulsion system ratio

- **eBuses > 41.5%**
ZeEUS: Bringing electrification to the heart of public transport

Support electric bus deployment (2013 – 2018)

40 Consortium Partners
20 User Group Members
Coordinator: UITP

22.5 million €
EU funding: 13.5 million €

10 demo cities
> 107 electric buses

A set of tools and guidelines to accompany bus stakeholders in ebus deployment

1 common evaluation methodology

Deutsch-Japanisches Umwelt- und Energiedialogforum, Berlin April 18, 2018
ZeEUS Demo Cities (10 cities, > 100 eBuses)

High capacity buses:
- 12 meters,
- articulated,
- double-deckers

Different e-type
- Plug-in Hybrid,
- Full-electric,
- Battery Trolleys

Energy supply modes:
- Plug-in,
- Inductive
- Conductive (pantogr.)
- Overhead (trolley)

Fast and slow charging strategies:
- Overnight (depot)
- Opportunity (terminal stops)
- On-route (trolley)
Example Barcelona – Opportunity Charging

2 Solaris articulated fully electric battery buses
Opportunity charging at two terminal stations
  • conductive system (Schunk smart charging)
Recharging at bus depot
Example Bonn – Depot Charging only

6 Sileo fully electric battery buses

- depot charging only (plugs)
- fossil heating system
- range approx. 200 km, deployment on different lines
ZeEUS eBus Performances

**ZERO EMISSION URBAN BUS SYSTEM (ZeEUS) PROJECT**
For the period Aug 2015 – Jan 2018

Figures coming from 8 cities across Europe

- **5,661,126 km**
  The distance travelled by ZeEUS buses running in pure electric mode

- **2,151,228 litres**
  The amount of diesel fuel saved by the ZeEUS bus project

- **3,273 tons**
  The amount of carbon dioxide emissions prevented by the ZeEUS bus project

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1. For vehicles increasing from 12 (2015) to 70 buses (53 BEV, 11 PHEV, 6 Trolley-Battery)
2. Assuming 38/100 km
3. ISO 16258 factor for Diesel and G88i factor for national grid mixes (2014) and diesel supply
ZeEUS addressing the 5 main challenges for eBus deployment in Europe

- High upfront cost
- New challenging operations
- New ways to procure:
  - Vehicles & Equipments
  - Operation services
- Standardisation / Interoperability
- Reinforcing cooperation energy/bus
ZeEUS Background

ZeEUS started in 2013

- Early stage of knowledge about high capacity electric urban bus systems
- Project partners started from « a blank sheet of paper »

Pioneers partners – *learning by doing*

- Buses described in the proposal were quite different from the one realised in the demonstrations
- Authorities were not used to consider eBus as a system
- Operators had a very limited knowledge of operating eBuses

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1 or 2 buses / pilots
Small lines / simple operations
More lines / large service

2013 2018
Electric bus orders in Europe are growing fast!

Source: ADL - 2017
Urban zero emission bus: EUROPEAN CITY STRATEGIES

2015-2025 Strategies of zero emission bus deployment in European cities
• Data-set 43.000 buses

Rapid evolution in the last years
• 2014 – 2015 one / two test vehicles
• 2015 – 2016 first entirely electric bus-lines
• 2017 – subset of bus network (tens of vehicles)

Exercise done in 2015 – Revision of forecast in 2017 shows higher grow-rate
Urban bus: market share projections by propulsion technology in Europe

EU Urban Bus Market Share Evolution

- **2020**: 
  - Clean Diesel: 47.7%
  - Diesel-Hybrids: 22.1%
  - Electric: 11.9%
  - Electric (Fuel Cells): 16.2%
  - CNG/Bio-gas: 2.1%

- **2025**: 
  - Clean Diesel: 27.2%
  - Diesel-Hybrids: 32.7%
  - Electric: 7.4%
  - Electric (Fuel Cells): 19.2%
  - CNG/Bio-gas: 13.5%

- **2030**: 
  - Clean Diesel: 16.5%
  - Diesel-Hybrids: 45.2%
  - Electric: 12.5%
  - Electric (Fuel Cells): 18.2%
  - CNG/Bio-gas: 7.5%

Source: ZeEUS/UITP (VEI) - 2017

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