Financing schemes for bus electromobility in Europe

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WHY CITIES?

- 3% of globe’s surface
- 70-75% of carbon emissions
- 80% of global GDP
- 60-80% of global energy demand
WHY PUBLIC TRANSPORT?

60 people go downtown ... CONGESTION
## Erdf & Cohesion Fund for Mobility

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>42.6</td>
<td>30.0</td>
</tr>
<tr>
<td>Rail</td>
<td>23.1</td>
<td>18.7</td>
</tr>
<tr>
<td>Transfer from Cohesion Fund to Connecting Europe Facility</td>
<td></td>
<td>(11.3)</td>
</tr>
<tr>
<td>Seaports</td>
<td>3.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Airports</td>
<td>1.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Cycling/walking</td>
<td>0.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Inland waterways</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Urban transport</strong></td>
<td>8.1</td>
<td>12.4</td>
</tr>
<tr>
<td>ITS</td>
<td>1.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Multi-modal transport</td>
<td>1.8</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>82.5</td>
<td>70.1 (81.4)</td>
</tr>
</tbody>
</table>
WHY BUS?

Q1: How many bus journeys per year worldwide?

Q2: What is the bus share (%) of total PT journeys?

~ 450 bn bus journeys per year worldwide
(32.3 bn in Europe)

- Buses account for 83% of the total PT journeys worldwide
- Buses are the backbone of any public transport system + are the only PT mode in many cities
- Urban Bus contribution to city transport pollution is 8% calculated pas./km
TECHNOLOGY VS ENVIRONMENT

PM & NOx: Hundredfold improvement since 1993 from EURO I to EURO VI

Bus contribution to urban pollution must be calculated per passenger per km

Renewal of old-bus fleets towards Euro VI has important effects

On road Plug-in emissions

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On road Plug-in emissions
E-BUS: FLEETS IN EUROPE (NOW VS PLANNED)

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

Total: 41.5%
E-BUS: ORDERS IN EUROPE

Number of Vehicles Ordered by Year

- Electric bus orders
- 2018 (6 months)
1. The global uptake of e-buses in PT fleets is accelerating
2. 2016: estimated 345,000 e-buses worldwide
3. **China** leads the deployment of e-bus fleets (341,000)
4. Europe: there is 1,273 e-buses (100% increase vs. 2015); e-buses represent **10%** of 20,000 buses procured annually
5. Europe: the market is **growing faster than anticipated** – current orders have reached 2025 levels
EU Urban Bus Market Share Evolution (industry forecast)

- **Clean Diesel**
- **Diesel-Hybrids**
- **Electric**
- **Electric (Fuel Cells)**
- **CNG/Bio-gas**

### 2020
- Clean Diesel: 47.7%
- Diesel-Hybrids: 11.9%
- Electric: 22.1%
- Electric (Fuel Cells): 2.1%
- CNG/Bio-gas: 0%

### 2025
- Clean Diesel: 27.2%
- Diesel-Hybrids: 32.7%
- Electric: 19.2%
- Electric (Fuel Cells): 7.4%
- CNG/Bio-gas: 12.5%

### 2030
- Clean Diesel: 16.5%
- Diesel-Hybrids: 45.2%
- Electric: 18.2%
- Electric (Fuel Cells): 16.5%
- CNG/Bio-gas: 7.5%
ZERO-EMISSION STRATEGIES

- **Barcelona** – From 2025, all new buses procured will be ZE
- **Cluj-Napoca** – By 2025, the city’s whole PT fleet will be ZE
- **Copenhagen** – From 2019, all new buses procured will be ZE
- **Warsaw** – As from 2025, 20% of the bus fleet ZE and growing
- **Paris** – Target of 4,700 zero/low emission buses by 2025
- **Amsterdam** – All bus fleet by GVB will become electric by 2025
- **Flanders** – By 2025, all De Lijn urban buses will be BEVs or PHEVs
- [...]

[Image of UTIP logo]
CASE STUDY - POLAND

- E-bus market one of the largest and fastest growing in Europe (EU funds-driven)
- E-bus uptake strongly supported by several Ministries and govt institutions (NCBiR, NFOSiGW, PFR) – **€2.3bn financing** (2018-2028)
- Strong funding and *incentive mechanisms* in place (Low-Emission Transport Fund, Emission-Free Public Transport (BTP) program, etc.)
- **Mature supply-side market** (Solaris, Ursus, Autosan, Volvo plant)
- Strong regulatory framework/targets: 2018 E-Mobility/Alternative Fuels Act
CASE STUDY: MZA WARSAW

MZA: Municipal Bus Operator

- Public Service Contract: 2018-2027
- Fleet: 1360 buses (incl. 32 e-buses, 35 CNGs, 5 hybrids)
  - Total revenue (2017): €210m
  - Total investment expenditures (2009-2017): €155m
  - Total investment expenditures (2018-2027): €323m

2019: Tender for 130 articulated e-buses

+ ‘Redutowa’ ZE vehicles depot + charging infra
# CASE STUDY: MZA WARSAW

Warsaw’s Fleet Electrification Plan (2015 – 2020)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of e-buses</th>
<th>12m</th>
<th>18m</th>
<th>E-bus share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td>0.7%</td>
</tr>
<tr>
<td>2017</td>
<td>21</td>
<td>20</td>
<td>1</td>
<td>1.5%</td>
</tr>
<tr>
<td>2018</td>
<td>32</td>
<td>30</td>
<td>2</td>
<td>2.4%</td>
</tr>
<tr>
<td>2019</td>
<td>102</td>
<td>30</td>
<td>72</td>
<td>7.5%</td>
</tr>
<tr>
<td>2020</td>
<td>162</td>
<td>30</td>
<td>132</td>
<td>11.9%</td>
</tr>
</tbody>
</table>
CASE STUDY: MZA (FUNDING STRUCTURE)

→ EU FUNDS (COHESION FUND – OP ‘I&E’ 2.2.6.VI)
  €95.9m – total project cost for 130 ZEVs (€41.3m grant + €54.5m own contribution)

→ CONNECTING EUROPE FACILITY (BLENDING CALL)
  €6m – total project cost for ‘Redutowa’ depot
  €1.2m grant + €2.6m own contribution + €2.2m investment loan

→ EIB LOAN
  €95.3m Grant Investment Funding

→ MUNICIPAL COMPENSATION
Stolichen Avtotransport EAD: Municipal Bus Operator

Average age of fleet (2012): 21.8 years
CASE STUDY: SOFIA BUS COMPANY

First Stage: PROGRAM 2012-2016

• Bus Fleet Renewal Programme 2012-2016
• Finding a possibility of financing from the EU Funds

→ ERDF/CF (OP ‘E’ 2007-2013)

• Tender for 126 CNG buses €34m (20% own funds + 80% EU grant)
• All buses deployed by May 2015
• Reducing pollution by 665 tons per year
• €5.8m of the company's funds saved for the past 3 years
• For the whole life cycle (12 years), fuel savings of €23m
In 2014, the Sofia Municipality gets a long-term EIB loan (€40m, of which €21.5m for low-emission buses)

A €17m-worth of tender for 110 12-meter diesel Euro 6 buses

All buses (Yutong) deployed by September 2016
In 2016, the Sofia Municipality adopts the next development program

- Big tenders for 142 CNG buses with a lease
- Tender for 20 full electrical buses with a lease
- Tender for 20 hybrid or other alternatively fuelled buses
CASE STUDY: SOFIA BUS COMPANY (2016 VS 2018)

- **Euro 6**: 44%
- **Euro 5**: 1%
- **Euro 4**: 6%
- **Euro 3,2**: 49%

**Electric**
- **20%**
- **4%**
- **6%**
- **1%**

**Other emissions standards**
- **69%**
CASE STUDY: RIGAS SATIKSME

Rigas Satiksme: Municipal Bus Operator

Example of blending CEF grant and EIB/EFSI Finance

→ **EIB loan (with EFSI guarantee approval)** €75m
  - Upgrade the tram system (20 new trams, infra, depot)
  - Purchase 10 hydrogen buses (FCEV), 10 trolleybuses with FC range extenders
  - Charging infra (hydrogene fuel production/storage unit)

→ **CEF grant** €8m
  Co-finance installation of hydrogen fuel production/charging facilities

→ **Own funds + commercial bank loans** €112m
E-BUSES: FIVE CHALLENGES AHEAD

- High Upfront costs
- Challenging operation
- New governance models (Procurement and contracts)
- Interoperability and flexibility
- Building trends and cooperation with the energy sector
E-BUSES: THE COST CHALLENGE

• E-bus = 2 x the price of a conventional bus (battery = 45% cost)
• Charging infrastructure cost and installation
  o Fast charging infrastructure
  o Or...More buses
• Local Depreciation rules (up to 30% of OPEX !)
• Very local TCO models
• Different maintenance cost
E-BUS DEPLOYMENT: LESSONS LEARNED

- Clean bus technologies: wide array of solutions – which one is the most suitable?
- Life Cycle Cost (TCO): a tool to sustainability
- A good understanding of specific local contexts is the key decision-making factor = Bus technologies must be assessed on the basis of their potential to address the identified local needs
- Fleet renovation should be implemented in the framework of a well-structured and holistic plan to foster urban sustainable transport
- E-bus is not a guarantee for a seamless bus transport system = complementary/performance effectiveness measures needed!
E-BUS FINANCING: KEY TAKEAWAYS

- Government ambitions and financing remain critical
- Public transport needs a prominent feature in government policy agendas
- E-bus is just a part of a large urban transport equation

More e-buses or more public transport/modal shift?
A SYSTEMIC APPROACH

AVOID SHIFT IMPROVE

Renewal of old bus fleets towards CLEAN TECHNOLOGIES

Policies to foster the MODAL SHIFT to multimodal public transport

MULTIPLIER EFFECT on air quality, urban mobility, citizens’ health