BEST PRACTICES ON CLEAN BUSES

State of play, testing & implementation in cities


Umberto Guida – Director R&I, UITP
FLEET EXTENSION & RENEWAL

The view of Public Transport Operators
FLEET RENEWAL IS A PRIORITY

BUS IS CLEAN
Urban Bus contribution to city transport pollution (25%) is 8% calculated per passenger per km

Estimated emissions reduction by renewing the fleet

In Europe, 45% - Euro III or older

Renewal of old-bus fleets towards cleaner solutions is a priority

Source: www.3ibs.eu
TRANSITION TO CLEAN BUS FLEETS

The changes leading to the transition to clean bus fleets shall improve and never put at risk the basic service of a bus.

Service excellence
Bringing passengers efficiently and comfortably from A to B
URBAN BUS: MARKET SHARE PROJECTIONS BY PROPULSION TECHNOLOGY IN EUROPE

EU Urban Bus Market Share Evolution (industry forecast)

- **Clean Diesel**
  - 2020: 47.7%
  - 2025: 27.2%
  - 2030: 7.5%

- **Diesel-Hybrids**
  - 2020: 22.1%
  - 2025: 13.5%
  - 2030: 16.5%

- **Electric**
  - 2020: 11.9%
  - 2025: 32.7%
  - 2030: 45.2%

- **Electric (Fuel Cells)**
  - 2020: 2.1%
  - 2025: 7.4%
  - 2030: 12.5%

- **CNG/Bio-gas**
  - 2020: 16.2%
  - 2025: 19.2%
  - 2030: 18.2%

Source: ZeEUS/UITP(VEI) - 2017
BEST PRACTICES & LESSON LEARNED

• Current **clean bus technologies**: wide array of solutions... which one is the most suitable?
• A good understanding of the **specific local context** becomes the key decision-making factor
• Examples from **pioneering activities in Europe**
ZEEUS PROJECT: BOOSTING E-BUS DEPLOYMENT

- 10 cities, over 100 e-buses involved
- Tools & guidelines for decision-makers to assess If, When and How to deploy e-bus systems

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

Figures coming from 10 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 32 (2015) to 109 buses (84 BEV, 11 PHEV, 6 Trolley-Battery)
2 Assuming 38/100 km
3 ISO 16258 factor for Diesel and Gali factor for national grid mixes (2014) and diesel supply
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 (pantograph)
- Overhead (trolley)

Fast and slow charging strategies
- Overnight (depot)
- Opportunity (terminals)
- On-route (trolley)
E-BUS SYSTEMS OPERATING IN EUROPE

ZeEUS eBus Report #2
An updated overview of electric buses in Europe

- 90 cities, over 800 vehicles and over 20 million km driven in pure electric mode
- 32 manufacturers
- 8 electric system suppliers

DOWNLOAD YOUR DIGITAL COPY AT: www.zeeus.eu
JIVE: FUEL CELLS JOINT PROCUREMENT

- Commercialisation of fuel cell buses
- 139 vehicles across 5 countries
  - double of FC buses operating currently in Europe
  - First tenders already ongoing
- Economy of scale through joint procurement
  - 30% cost reduction foreseen vs. state of the art
EBUS OPERATION TODAY - SUMMARY

Small fleets of electric buses

Simple operational conditions:
- The daily kilometer load not too high.
- Demands on passenger’s capacity not high.
- Energy consumption not too high (no steep climbs, average speed not too low).
- Enough time to charge the batteries or at the terminal.
- There is the back up of conventional buses.

Not always necessary a system approach but a vehicle replacement philosophy

Bigger fleet of e-buses:
- Replace a fleet of conventional buses (so no back up)
- Cover a higher kilometer load on a daily basis
- The operation time is 20 hours/day or more (over 300 km)
- Need to transport a high capacity of passengers
- The time available for slow charging overnight is very limited.

A complete new transport system shall be deployed.
- Interoperability is a must
UITP SORT PROTOCOLS

- Full electric & plug-in hybrids
  - 2017
- Gaseous fuels
  - 2015
- Double-deck buses
  - 2014
- Non plug-in hybrids
  - 2014
- 9 to 18 m single deck buses
  - 2009
- 12 m single deck diesel buses
  - 2004

www.uitp.org
UITP WORK ON STANDARDISATION

- Charging Use Cases
  Methods for operating electric buses during charging both in depot and during opportunity charging

- Identification of main standards involved in the standardisation of e-Bus Charging Systems
  Ideal roadmap for standards update / development

- Focus on 4 possible charging solutions
KEY LESSONS LEARNT (1) - ZEEUS PROJECT

• Fleet renewal in the frame of urban strategy for mobility and decarbonisation

• Paradigm shift: from vehicle procurement to system procurement

• Early involvement of stakeholders from early planning stage: joint feasibility studies

• IT supporting fleet monitoring to optimise operation
KEY LESSONS LEARNT (2) - ELIPTIC PROJECT

• Existing electric infrastructure for Public Transport can facilitate the next wave of electrification
• Operators need to apply **smart charging solutions** to efficiently power their electric fleets
• New battery technologies offer a good opportunity to **revamp the trolley-bus systems** by extending their line and providing part of the service without catenary (e.g. city centers)
KEY LESSONS LEARNT (3) - EBSF_2 PROJECT

- Use of new type of propulsion with lower energy-density requires careful management of on-board energy -> New solutions for auxiliaries
- Vehicles with increasingly complex technology call for a new approach to maintenance. Remote diagnostic and predictive maintenance based on standard architecture help greatly
- Clean mobility can stimulate industries and users to re-think the bus as a new attractive urban object designed around its message of “cleanness”
BEYOND CLEAN FLEETS RENEWAL, TOWARDS LIVEABLE CITIES

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
THANK YOU!

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More Information

For info or further questions on this seminar and the activities of the JASPERS Networking Platform, please contact the JASPERS Networking and Competence Centre at the following email:

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