UITP Research & Innovation Day: ZeEUS and the other bus projects
Cleaner Cities/Buses through Cleaner Transport Facility
ZeEUS, October 2017

Per ALS, Mobility Department – European Investment Bank
Our Approach
Innovative and cleaner transport

- Lending in the transport sector is guided by **EU policy objectives**
- EIB transport lending policy:
  - mix of transport solutions, covering all modes, though carefully planned to control the **negative environmental impacts of transport**
  - support the fight against **climate change**
  - development of **breakthrough technologies**, which lead to: (i) lower consumption of fossil fuels; (ii) emission reduction; or (iii) an increase in safety.
Our Offer

- Providing attractive long-term lending
- Deploy existing and setting up new financial instruments that can help deploying alternative fuels infrastructure
- Financial and technical expertise
  - Promoting EU objectives
  - Providing advice to promoters
  - Sharing knowledge and providing guidance
  - Bringing comfort to other investors
How the EIB can help

Problems:

- Priority ?
- Technological Risk ?
- Liquidity ?
- Financial Risk ?
- Time Horizon ?
- Organization ?
- Knowledge ?

How can EIB help?

- EC Priority
- EC Grants
- Loans
- Lower rates
- Patient Money
- Advisory
- TA
Bus-market stakeholders:

- **Political Body,** e.g.: City, Region, Province
- **Public Transport Authority (PTA)**
- **Public Transport Operator (PTO)**
- **Owner of infrastructure**
- **Owner of vehicles**
- **Manufacturer Infrastructure**
- **Manufacturer vehicles**
- **Maintainer infrastructure**
- **Maintainer vehicles**
- **Energy Supplier**
- **Political power & funding source**
- **Public service obligation 1370/2007/EC**
- **Lease agreements**
- **Supply contract “CAPEX”**
- **Supply contract “OPEX”**
EIB products

We help catalyse investment

<table>
<thead>
<tr>
<th>LENDING</th>
<th>BLENDING</th>
<th>ADVISING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td>Combining EIB finance with EU budget</td>
<td>Prepare, evaluate and support the</td>
</tr>
<tr>
<td></td>
<td>(Project Bond Initiative)</td>
<td>implementation of projects (JASPERS)</td>
</tr>
<tr>
<td>But also:</td>
<td>Higher risk projects for innovation</td>
<td>Support for public/private partnerships (EPEC)</td>
</tr>
<tr>
<td>Guarantees</td>
<td>(InnovFin)</td>
<td></td>
</tr>
<tr>
<td>(trade financing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity participation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attracting FUNDING for long-term growth
Case Study:
Las Palmas Bus Rapid Transit

- EUR 50m loan to construct segregated **Bus Rapid Transit (BRT)** system
- purchase of **17 hybrid/electric buses**
- Construction of three new stations, 17 stops, 1 traffic control centre
- creation of new bicycle lanes and improvement/widening of pavements
- Objectives: reduce car-dependency, enhance public transport, urban regeneration
Case Study: Artois Gohelle (FR)

- **EUR 110m** loan to finance two BRT lines to link principle urban centers
- Loan will facilitate the purchase of around 40 hybrid and 6 hydrogen buses
- More than 110 km of roadway will be redeveloped to improve bus traffic
- Region-wide project serving three urban areas covering almost 1 000 km2 with more than 650 000 residents

**Investment will:**
- restructure urban mobility;
- enhance quality of public transport (regularity, comfort, time savings and service);
- help to reduce pollutant emissions.

Source: Syndicat Mixte des Transports Artois-Gohelle Webpage
Case Study: Riga Transport Company (LV)

- Blending CEF grant and EIB/EFSI finance
- Borrower: Riga Transport Company (RTC), public transport operator owned by Municipality of Riga
- **EUR 75m** EIB loan to:
  - Upgrade the tram system (new rolling stock and infrastructure)
  - Modernise existing tramway depot
  - Purchase 10 new hydrogen fuel cell buses, 10 new trolleybuses with hydrogen fuel cell range extenders and associated refuelling infrastructure
- **EUR 8m** CEF grant to co-finance installation of hydrogen fuel production and charging facilities
- Remainder to be financed by RTC’s own funds and other bank (commercial) loans

Source: Latvian Information Agency (2016), Leta/deflutter
Cleaner Transport Facility (CTF)

- Support the **accelerated deployment** of new cleaner transport technology
- Full range of **available tools** from EIB and EC for public and private entities
- **Financial products**
  - EIB loans/guarantees/equity
  - Financial instruments e.g. CEF Debt Instrument
- **Advisory services** e.g.
  - EIAH – Advisory Hub
  - ELENA – technical assistance
  - Horizon 2020 – InnovFIN
- **EC grants** – CEF Transport Blending Call
- **Focus:**
  - Public transport buses / public fleets
  - Alternative fuel infrastructure on strategic networks
Next steps
What now?

✓ EIB has with EC cleaner buses in focus
✓ EIB will want to do more business in the field
✓ EIB will seek to tailor to needs of the sector

Please **come forward**, and we will seek to find common grounds.
Thank you!

More information at: www.eib.org
info@eib.org
Tel.: +352 4379-22000
p.als@eib.org
UITP VISION

Umberto Guida,
Research & Innovation Director,
UITP
What do we want to achieve?

But where are we?
CLEAN FLEETS: WHAT IS THE PRIORITY?

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

In Europe, 45% - Euro III or older

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

Estimated emissions reduction by renewing the fleet

Source: www.3ibs.eu

UITP
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

Respondents distribution according to future plans to change propulsion system ratio

eBuses > 41.5%
ELECTRIC BUS ORDERS IN EUROPE ARE GROWING FAST!

Number of eBuses Orders in Europe / year

Source: ADL - 2017
URBAN BUS: MARKET SHARE PROJECTIONS BY PROPULSION TECHNOLOGY IN EUROPE

Source: ZeEUS/UITP(VEI) - 2017
UITP STRATEGY FOR DECARBONISATION

- Global & integrated mobility vision
- Better Quality of Life through high Quality service to passengers
  - Cleaner Vehicles
  - Accessibility for all
  - High commercial speed
  - PT Dedicated Infrastructure
  - Traffic & operations management
  - Efficient combined & shared mobility
  - Smart use of energy in the PT System

- Policies and strategies promoting Modal Shift

BEYOND CLEAN FLEETS
TOWARDS CLEAN CITIES

Renewal of old bus fleets towards Clean Technologies

Policies to promote the Modal Shift toward Public Transport

Multiplier effect on air quality, urban mobility, citizens’ health
**ELECTRIFICATION: A REVOLUTION?**

Electrification already produced a revolution in public transport.

From horse-powered to electric trams.

**UITP was already following this trend:**
The “high cost of horses’ maintenance vs. electricity traction” was one of the key topics discussed at the UITP’s Berlin Congress in 1886.

Following such revolution, 50% of Public Transport today are Electrified (tram, metro, trolley...).
THANKS

Umberto Guida - UITP
How ZeEUS & the other foster the Clean Bus Deployment

Umberto Guida, Research & Innovation Director, UITP
UITP AND INNOVATION

UITP support members in

- Identify innovations that will impact PT business in short / long term
- Assess the effect of innovation in the PT ecosystem
- Build knowledge to choose and deploy innovation
R&I PROJECT ABOUT BUSES

**ZeEUS**
- The first and largest project on high capacity urban electric bus systems

**ELIPTIC**
- Complementing ZeEUS: integration in grid, evolution of trolleybuses

**EBSF_2**
- Innovative Bus Systems: IT standard, eBus design, auxiliaries...

**JIVE / JIVE_2**
- Deployment of large fleets of Fuel Cell buses

**ASSURED**
- ZeEUS follow-up: interoperability, high power charging, smart charging of large fleets
THE RIGHT PROJECT AT THE RIGHT MOMENT

From high level concept development up to large scale fleet deployment

eBus Innovation Projects vs eBus Market Grow
PROJECTS HELP TO SOLVE THE 5 MAIN CHALLENGES FOR THE CLEAN BUS DEPLOYMENT IN EUROPE

- High upfront cost
- New operations
- Standardisation / Interoperability
- New ways to procure:
  - Vehicles & Equipments
  - Operation services
- Reinforcing cooperation energy/bus
HIGH UPFRONT COST

TOP Challenge 1

Cost elements
  ‣ Identification and characterisation involving all stakeholders categories (ZeEUS)

From running costs to investment.
  ‣ New business models (ELIPTIC & ASSURED)

Battery Costs & lifetime
  ‣ Battery ageing and new technologies (ZeEUS & ASSURED)

Contribution of auxiliaries and driving style
  ‣ Development of innovation in EBSF_2

Economy of scale
  ‣ Large Fuel Cell bus fleets deployment in JIVE & JIVE2
NEW OPERATIONS

- Exchange of experience
  - All project demos (more than 60 city demonstrations) are a platform to help the understanding of the operations of new technologies.
ZeEUS Demo Cities

**LONDON**
- 3 plug-in hybrid (induction)
- Double deck
- Alexander Dennis

**PARIS**
- 10+ full electric
- BOLLORE 12m

**BARCELONA**
- 2 full electric
- IRIZAR 12 m

**EINDHOVEN**
- 43 full electric (opportunity)
- VDL 18m

**STOCKHOLM**
- 8 plug-in hybrid
- VOLVO 12m

**BONN**
- 6 full electric
- BOZANKAYA 12m

**WARSAW**
- 10 full electric
- SOLARIS 12m

**PLZEN**
- 2 full electric
- SKODA 12m

**MÜNSTER**
- 5 full electric
- VDL 12m

**CAGLIARI**
- 12 m Battery Trolleys
- 4 VOSSLOH /VAN HOOL
- 2 SOLARIS
NEW OPERATIONS

- Exchange of experience
  - All project demos (more than 60 city demonstrations) are a platform to help the understanding of the operations of new technologies.

- Training is key to reduce ramp-up time
  - Material & modules developed in ZeEUS, JIVE2 and ASSURED

- Trade-off = capacity vs autonomy
  - Battery technology evolution in ASSURED
  - High Power Chargers for terminals in ASSURED
  - Advanced concepts for battery trolley operations in ZeEUS and ELIPTIC

- New concepts for Bus Service design
  - Optimization of bus operations in ZeEUS

A chosen technology performs well if put in its "best operational conditions"

Source: EBSF Project (DG-R&I)
Study by VDV and Prof. Dr. Ralph Pütz (Landshut University)
PROCUREMENT & CONTRACTS

Procurement

- Procurement principles in ZeEUS
- Relevant indicators for procurement in ZeEUS and JIVE
- Use of CEF and blending tools in JIVE

Financing mechanisms

- optimal requirements ZeEUS
- tender structure UITP and ZeEUS

eSORT cycle

- validation supported by ZeEUS

Generic SWOT Analysis in ELIPTIC
Development of EU Standard

- ZeEUS supported the start of the work in CEN-CENELEC answering the EC Mandate 533/15
- Use Cases for depot and opportunity charging jointly developed by ZeEUS, UITP, VDV

Development of interoperable solutions

- ZeEUS & UITP supporting the joint effort industry and operators to develop standards
- ASSURED will continue by widely testing interoperability also between bus and urban truck

Use Cases for standardisation – www.zeeus.eu
ENERGY SECTOR: BUILDING TRUST & COOPERATION

Integration in energy infrastructure

› Criteria for optimising location of charging point and grid capacity in ZeEUS
› Use of existing PT power network in ELIPTIC
› Hydrogen infrastructure in JIVE

Operations

› smart charging for fleet upscaling in ASSURED
PHASED APPROACH

Action lines to Support PT stakeholders to deploy eBuses

Joint Effort of Institutions Stakeholders Cities

IF
Know
Decide

WHEN
Plan
Regulate
Finance

WHAT
Specify
Procure
Deploy

HOW
Operate
Maintain

Projects produce knowledge, guidelines, tools, to support stakeholders
• Define a **global & integrated mobility vision**
  • UITP AP «Connection people and places, Integrated Mobility Plans for Sustainable Cities » - April 2014
• Exchanges **experiences** and **knowledge**
  • ZeEUS report, site visits...
• **Feasibility study** with all stakeholders
  • *Wide scope: risk, cost analyses...*
• Define **own operational needs** from Clean Buses
  • *assess IF eBuses are the right Clean Bus solution for the identified needs and decide*
• Solve **trade offs** in **own scenario**
  • *Passenger capacity vs. Battery weight*
  • *Driver/bus utilization vs. Charging time*
  • *Fast charging stations costs vs. Battery/spare bus cost*

**IF: Know & Decide**

Start from the needs, not the solution
THE Bonn Vision to 2030: The Complete Conversion from Diesel to E-Buses

• Market exploration
• Feasibility study
• Fields tests
• Technical specifications
• Charging concept
• Operational concept

→ Complete Conversion of all conventional diesel buses to full electric propulsion until 2030 by decision of the Executive Board
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
• Ensuring support from competent Authorities
  • Ask for Urban policies to get maximum advantage by using Clean (electric) Buses in the city
  • Possible use of PT power network for charging eBuses
• Analyse the different legislation impacting eBuses
  • Ex. emissions regulations...
• Most suitable funding & financing schemes
• Embrace system approach
• Set up project governance
  • Optimise the relation between PT, Energy and ITS in cities, with mutual convenience
  • Possible contribution of eBuses to smart-grid
  • Define best contractual conditions for energy provision

WHEN: Plan, Regulate, Finance

Don’t rush, it is all about planning
SYSTEM APPROACH IS NECESSARY

Operational context, costs and technical performances set the characteristics of the system elements.
• Define risk sharing schemes between Municipalities, Authorities and Operators according to their role

• Develop partnerships with industry, procuring entity, regulators, financing actors, energy suppliers...

• Stimulate and support procuring entities to adapt tender process to eBuses peculiarities
  • Develop the culture of “system” procurement (like tram)
  • Specs, Indicators, Evaluation Methodology
  • UITP Tender Structure document
  • E-SORT: reproducible test cycles for on-road tests of buses (consumption oriented)

• Facilitate infrastructure deployment processes
  • Building permits, depot upgrade, energy cable connections, roadworks...

WHAT: Specify, Procure, Deploy

Expect the unexpected!
BEING PREPARED ...

Gaspipe – not shown on any city map!

The pantograph pole has to be entirely redesigned to respect the snow clearance regulations

IT communication test! EMC test
• Changes in the **Bus Depot**
  • *Design, operations, cleaning, safety aspects...*
  • *Coordination with other services: firefighters, police...*
• Optimised **operation design** and **integration in bus network**
• Optimisation of **charging operation** (operation vs costs)
  • *Smart charging*
  • *Optimisation of auxiliaries’ energy consumption*
• **Training:** new skills for workers
  • *New driving style*
  • *New maintenance procedures*
• Evaluate operations including staff and passengers’ satisfaction

**Don’t forget the PEOPLE!**
THANK YOU!

Umberto Guida
UITP Director – Research & Innovation

umberto.guida@uitp.org