

# INTEGRATE + CONNECT!

Two world class events are joining forces and will take place simultaneously in Kortrijk, Belgium, in October 2017.

This will provide an unrivalled opportunity to look at the latest developments in the bus sector

or the first time ever, UITP's biennial International Bus Conference will be

organised in conjunction with Busworld Europe, the world's leading bus and coach exhibition. The two-day event will be held in Kortrijk, Belgium, and offers delegates the chance to discover fresh ideas, best practice and advice for implementing the latest in bus technology.

Under the theme Integrate + Connect the programme features a comprehensive selection of topics, exploring major trends and developments impacting the bus industry, including:

- How to connect buses with their surroundings effectively;
- Autonomous buses;
- Roll out of large electric bus fleets;
- Cost efficiency;
- Staying competitive in times of digitalisation;
- Modular and high capacity vehicles;
- How new mobility services can be integrated with traditional public transport.

For more information and an up-to-date programme visit [utpbusworld.uitp.org/programme](http://utpbusworld.uitp.org/programme)

**Busworld Europe**  
Busworld Kortrijk was founded in 1971 and is the world's leading bus and coach exhibition. Only buses and coaches are exhibited, no other commercial vehicles are present. The event is organised by a bus and coach operator's association, B.A.A.V., instead of an exhibition organiser.

## New technologies and innovation

Bus systems account for some 80% of all public transport passengers worldwide but the humble bus has suffered from a certain image deficit in the past. It has often been perceived as noisy, slow, unreliable and polluting; however, thanks to the gradual introduction of new technologies and innovations, they are starting to mould a new image.

■ **Vehicles:** Even though 95% of all buses today run on fossil fuels, in the last decade customer demand has driven a genuine 'propulsion supermarket' of alternative fuels and drive-trains, offering a wide variety of clean fuel options to improve air quality, fight noise pollution and meet policy targets. The hybrid bus and e-bus (electric bus) are part of the range of options available, with e-buses offering the prospect of the electrification of diesel bus lines (see below for more about UITP's Zero Emission Urban Bus Systems project). From a passenger perspective, low-floor technology has made buses easily accessible and thus more appealing as a mode of transport. The bus can also cater for larger capacities than ever before, with double articulated buses able to transport up to 210 passengers per vehicle.

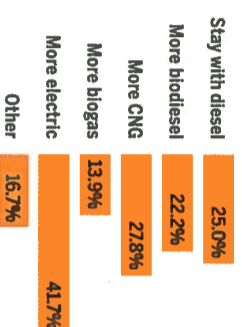
However, the bus should not be considered as a vehicular system alone. Just as essential as the vehicular component are infrastructure (such as bus stops) and passenger information (through apps and other new technologies). The Bus System Approach, first developed in the EBSF project (2008-2012), has been continued in the 3BS Project.

As part of 3BS, UITP recently conducted a survey amongst 44 of its European members (operators, authorities and municipalities) in 20 countries with public transport networks together serving a population of over 95 million



ABOVE: The Volvo 7900 Electric Hybrid now runs in Värramo, Sweden

## Survey responses from 44 UITP members on their future plans for bus fuels:



Source: EU DG Move - 3BS project

inhabitants, regarding their future plans for bus fuels. The results show a clear intention to move towards alternative fuels/drive-trains, particularly electric.

## Main arguments in favour of the bus

Since fairly recently the bus sector has been able to boast new assets that can claim more attention from the authorities and more widely from organising authorities and the general public. Today the bus can claim to be a clean and attractive mode of transport and offers many different advantages:

- They are very flexible in terms of network design and in response to demand needs as well as fast in terms of implementation;
- They are relatively cheap in terms of investment;
- Buses use 20 times less space (which is at a premium in urban environments) to transport the

same number of people as private cars. BRT lines can carry between 17,000 and 45,000 people per hour per direction;

- Buses can carry bigger capacities than ever before (double articulated buses and BHS-BRT);
- Buses also perform much better than cars as far as greenhouse gas emissions are concerned and the energy consumption of the bus per passenger/km is one third that of a car.

This last point is of course of the essence. In the inter-modal competition with rail and due to the environmental protection concerns of the last decade, the bus has long been perceived as a polluting mode, consuming fossil fuel energy and contributing negatively to CO2 emissions. But from the bus's point of view, with all the work done during the last few years in terms of hybrid and electric propulsion, the bus industry is claiming that it can now compete on equal or even better terms with rail and that it is now time to receive equal treatment.

**Excellence in bus operations and management**  
The European Bus System of the Future 2 (EBSF\_2) project is led by UITP and co-funded by the European Union's Horizon 2020 research and innovation programme.

The project (May 2015-April 2018) capitalises on the results of the previous EBSF project (September 2008 - April 2013). EBSF\_2 is aimed at developing a new generation of urban bus systems by means of new vehicle technologies and infrastructures in combination with operational best practices, and testing them in several European bus networks. EBSF\_2 has the ambition to improve the image of the bus through increased efficiency in terms of energy consumption and operational costs. The project brings together the main European bus manufacturers with leading suppliers and large operators with worldwide experience. Demonstration sites include: Helsinki, Gothenburg, Dresden, Stuttgart, London, Paris, Lyon, Ravenna, San Sebastian, Madrid and Barcelona.

by UITP bus benchmarking working group. It breaks down operations into five direct activities and nine support activities. The model is now ready for roll-out, following a "proof of concept" phase and is under deployment with a number of bus operators.

- **Fuel & Traction System Observatory:** The Fuel & Traction System Observatory of the Bus Committee aims at providing overviews of experiences with operating clean and alternately fuelled buses. It currently maintains an overview of hydrogen bus development every three years and of CNG every two years.

## What's new with BRT?

BRT, or 'Bus Rapid Transit', is a bus system running on fully or partially segregated infrastructure that offers:

- Higher frequency (e.g. down to every 90 seconds);
- Higher operating speeds (e.g. 22km/h);
- High capacity (2,000-6,000 people per hour per direction);
- Fully or partly segregated infrastructure;
- Attractive design (vehicles and stations).

The efficiency, speed and performance of buses depends heavily on the provision of dedicated lanes and stops. An increase of just 5km/h in 'commercial speed' on a busy line leads to 20% less fuel consumption, thus of greenhouse gas emissions. Increasing the average speed of buses can also go a long way to improving their attractiveness as a mode of transport.

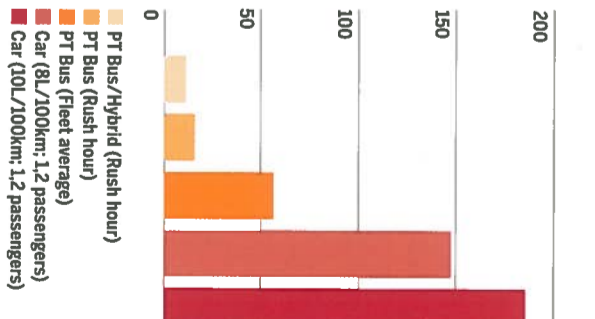
Various forms of traffic segregation are possible for bus lines ranging from a simple mark on the road, to road 'treatments' (movable barriers, queue jumpers, contra-flow lanes etc.) to the most advanced systems such as BRT. Eco-driving also has a role to play and has been proven to improve passenger comfort and reduce energy consumption and emissions by 5-10%.

In 2012, UITP published its BRT Guide, a leading source of information about myriad aspects of BRT systems including BHS (Bus with High Level of Service) materials for Europe. UITP concentrates efforts on BRT in facilitating regional platforms for the sharing of local operational solutions and feedback. UITP recently organised a

## AT A GLANCE



CO2 emissions for buses and cars in g/passenger/100km:



workshop on developing BRT in Egypt (November 2015). A seminar and study tour are in the pipeline for the near future in India and Saudi Arabia. BRT is also one of the main topics of the training module on bus planning and operations which is being offered in Qatar, Singapore and Abu Dhabi.

- **Find out more about BRT operations with the focus session, 'What's new with BRT?'** - 24 October, 14:00-15:30

## Buses in the era of digitalisation

■ **ITxPT - open systems for onboard equipment:** The ITxPT (Information Technology for Public Transport) Initiative aims to further drive forward in the implementation of standards for plug-and-play IT-systems applied to public transport. An integrated test bench offers services to specify, test, qualify and showcase IT solutions. The mission of the ITxPT Initiative is to support the deployment of standards and practices for onboard plug-and-play of IT systems for public transport and the relevant back-office features.

The IT architecture developed in the European Bus System of the Future (EBSF) project has paved the way for cost effective deployment of digital systems on board public transport vehicles and for back office applications, securing an open environment and constant competition. This standard IT architecture for public transport specifies communication protocols and hardware interfaces to offer a full interoperability of IT systems in PT applications. Based on open technology, it offers the possibility for operators and organising authorities to use public transport data anywhere in Europe through common mechanisms, standard rules and protocols. As from now, parts of these IT architecture specifications are included in European standards. This IT architecture is suitable for buses, coaches and tramways.

The ITxPT Initiative leads a joint effort to feed, support, promote and further contribute to the evolution of the relevant standards by providing returns of

experiences from technical implementations on the platform.

ITxPT members have access to the ITxPT platform to test their devices and applications in real operational conditions, supporting the uptake of this plug-and-play solution. By limiting the risks during the integration stage, these tests will facilitate the deployment process in operation.

**■ Towards autonomous vehicles: challenges and opportunities for the bus industry:** A number of initiatives at UITP address the opportunities and challenges related to the advent of autonomous vehicles. The Bus Committee, as well as some other relevant working bodies, is expected to work on the impact of autonomous vehicles on public transport. They will in particular consider the impact on traditional bus services, bus operations and the definition of bus networks. The opportunities for greater complementarities between regular bus lines and demand responsive transport will be considered. The deployment of connected and autonomous vehicle technologies, for all types of road vehicles, including buses, will be addressed in projects and within the Bus Committee.

**■ Find out more about autonomous vehicles with the plenary session, 'Connected & autonomous vehicles' - 24 October, 9.00-11.00**

**Vehicle Procurement**  
**■ SORT:** In 2004 UITP published the first SORT brochure on STANDARDISED ON-ROAD TEST CYCLES. It is a method developed by UITP for measuring fuel consumption and is used to compare different bus products presented in a call for tender. SORT is a collaborative program from operators and bus manufacturers with the aim of setting and developing a standard for the bus public transport sector to reduce the variety of different kinds of local, national and customised test cycles and to reduce costs. The SORT product refers to a referential which entails standardised SORT 1, 2, 3 cycles, a standardised test method



ABOVE: The TransMilenio bus rapid transit (BRT) system in Bogotá, Colombia

including a test protocol which describes how a SORT test should be conducted. The goal of SORT is to provide operators with a sound comparison base.

Following the release of the first SORT brochure in 2004, initially for 12-metre single chassis buses, mounted with diesel engines, an updated version of the brochure was released in 2009 providing SORT formula for different sizes of single deck buses.

Subsequently, UITP has released SORT documentation for hybrid/diesel (2014), diesel double deck (2015), and CNG (2016).

SORT is the only efficient tool that designs reproducible test cycles for on-road tests of buses in order to measure their fuel consumption. For many UITP members, the SORT cycle is the most reliable rule that exists to compare the consumption of fuel of several bus manufacturers' products in the frame of a call for tender. It is a real-life test, e.g. not an engine test but a test with a full-size bus on a test track (hence, 'on-the-road').

**■ eSORT Procedure:** Recent discussions have raised questions regarding Electric Hybrid (Diesel/Electric Plug-In bus) and Full Electric buses. There is a proposal (called eSORT) on how to measure energy for those buses.

In the UITP SORT working group there is still a request for a range for electric buses. A range to be presented for electric buses is not obvious - in each business opportunity a detailed analysis must be done to analyse and

the electric solution to urban bus systems. ZEEUS tests a wide range of different innovative electric bus technologies and changing infrastructure solutions in 10 demonstration sites across nine European countries with varying operational conditions to validate their economic, environmental and social viability.

Its three main goals are to:  
**■ Extend the fully electric solution to the core part of the urban bus network composed of buses of 12 metres or more;**

**■ Evaluate the economic, social and environmental feasibility of electric urban bus systems;**

**■ Facilitate the market uptake of electric buses in Europe.**

Why ZEEUS? UITP, together with European public transport businesses and manufacturers, have jointly produced an approach to the decarbonisation of transport and greenhouse gas emission reductions. Clearly, the best carbon reduction strategy is a shift from private to public transport. Not only would this reduce global transport emissions, it would also help tackle congestion, one of the other major issues facing cities today.

**Electric Bus Systems**  
**■ ZEEUS - Zero Emission Urban Bus System:** Through its Zero Emission Urban Bus System project, UITP is currently

coordinating a consortium of 40 partners with the aim to demonstrate the fully-electric solution to a wider part of the urban bus network. ZEEUS is the flagship electric bus project that also closely follows the development of electric bus systems all around the world through the ZEEUS Observatory. This initiative is co-funded by the DG Mobility and Transport of the European Commission with a budget of €22.5m (€13.5m EU funded); it is a 42-month project that began in November 2013.

ZEEUS extends the fully-electric solution to the core part of the urban bus network. It follows recommendations from fellow UITP European bus system projects (EBSF and 3IBS) to apply

**RIGHT:** The launch of Europe's largest zero emission hydrogen bus project, JIVE

In pursuit of an emission reducing strategy, low emission vehicles play a decisive role, particularly those with electric propulsion systems. Electrified public transport is not a new phenomenon. It is estimated that the proportion of public transport already powered by electricity ranges between 40-50%. This reflects the fields of well-established commuter railways, metro, light rail, trams and trolleybuses operated in the EU, carrying some 90 million passengers every single day. Thus public transport is already a major provider of clean electric vehicles and the ZEEUS project intends to be the beginning of a new and important chapter in the development of the fully-electric solution for transport by extending this technology to urban bus systems.

At the European level, technical specifications applicable to recharging points for electric buses still have to be defined. The complexity and variety of charging mechanisms makes a standardisation scenario more complex than for cars. European projects such as ZEEUS will

contribute to identifying which interfaces would be worth standardising and at which level (energy protocols, plugs, etc.), leading to more stable findings in the next years.

Developing electric vehicles of large capacity and creating infrastructure able to provide the required charging energy will facilitate the market up-take of electric buses in Europe. The project will also identify strategies to optimise the bus-to-grid interaction both at the depot and during service.

**■ For more information visit:**  
<http://zeus.eu/>

**■ ELIPTIC - Electrification of Public Transport in Cities:** ELIPTIC is an EU-funded project in which UITP is a partner that focuses on the integration of electric public transport in its urban environment and in particular with the electric and urban transport system.

It covers three thematic technology pillars:  
**■ Safe integration of e-buses into existing electric PT infrastructure, including en route charging and the upgrading of trolleybus networks**

with battery buses or trolley hybrids (diesel bus substitution)

**■ Upgrading and/or regenerating electric public transport systems (flywheel, reversible substations), including the analyses of smart energy management concepts for (existing) electric public transport networks;**

**■ Multi-purpose use of electric public transport infrastructure: safe (re)charging of non-public transport vehicles (pedelecs, electric cars/taxis, utility trucks) including the analysis of the potential of existing electric public transport infrastructure to become a backbone for smart electro-mobility.**

**■ For more information visit:**  
<http://www.dipic-project.eu/>

**■ JIVE - European Fuel Cell and Hydrogen Bus Platform:** JIVE is an EU deployment project of over 100 fuel cell buses, of which UITP is a partner and which is part of the European Joint Technology Initiative fuel cell. It aims at helping to overcome barriers and accelerate the deployment of fuel cell buses in Europe.

JIVE will enable the deployment

of 142 fuel cell buses across nine locations, more than doubling the number of fuel cell buses operating in Europe. The project will use coordinated procurement activities to unlock the economies of scale which are required to reduce the cost of the buses. They will operate in large fleets of 10-30 buses, reducing the overhead costs per bus, as well as allowing more efficient supply chains and maintenance operations. By working at this scale and with bus OEMs with proven vehicles, JIVE will ensure reliability at the level required for commercialisation.

JIVE will also test new hydrogen refuelling stations with the required capacity to serve fleets in excess of 20 hydrogen buses.

**■ For more information visit:**  
<http://www.fch.europa.eu/project/joint-initiative-hydrogen-vehicles-across-europe>

**■ UITP R&I Day (25 October): ZEEUS and other Bus Projects:** The main results of ZEEUS, the most important EU funded project about electric bus systems, running since 2013, will be the core topic of the day. ■

**WHAT IS UITP?**  
**A**s a passionate champion of sustainable urban mobility, UITP is internationally recognised for its work in advancing the development of this critical policy agenda. UITP has a long history to its name, and is the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes. Its aim is to make cities around the world vibrant and pleasant places to live and work.

**UITP MEMBERS**  
 UITP has 1,400 member companies giving access to over 18,000 contacts from 96 countries. The members are public transport authorities and operators, policy decision-makers, research institutes and the public transport supply and service industry.

**UITP GLOBAL PRESENCE**  
 UITP's main office is located in Brussels and it has 14 liaison and regional offices, as well as two Centres for Transport Excellence. The offices are in Istanbul, Moscow,

Astana, Sao Paulo, Bangalore, New Delhi, Hong Kong, Shenzhen, Abidjan, Johannesburg, Melbourne, New York, Casablanca, Dubai and Tehran. The Centres for Transport Excellence are in Singapore and Dubai.

**UITP BUS DIVISION**  
 The UITP Bus Committee, created in 1960 as the international committee for the study of buses, has been acquiring and sharing day-to-day operational and technical experience in the field of city bus operations and maintenance ever since. UITP's office in Sao Paulo plays a pivotal role in the exchange of knowledge on BRT systems. This is in addition to the information exchanged via the Bus Committee itself as well as through successive International Bus Conferences (Brisbane 2004, Bogota 2007, Lyon 2010, Istanbul 2012, and Rio de Janeiro 2014), various regional workshops and seminars, and regular knowledge products and services.

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