

## 2018 European Zero Emission Bus Conference Report

The second edition of the Zero Emission Bus Conference took place on 27 and 28 November 2018 in Cologne, Germany. Over 360 stakeholders from all across Europe attended the event. Representatives from local authorities, public transport operators, industry, and international regulatory and funding agencies discussed the routes to commercialisation and technological readiness of zero emission buses. The conclusion: **Zero emission buses are ready for mass market deployment.**

The ZEB conference calls on Europe, European manufacturers, cities and operators to take action and lead the global zero emission bus market.

### KEY MESSAGES:

-  Policy-makers, local authorities and operators express the urgent need to **make clean public transport happen now.**
-  The Clean Vehicle Directive review goes in this direction and should introduce mandatory targets for clean buses from 2025.
-  Industry players explain that the products are ready today, scaling up is the key to tackling the remaining challenges of affordability and further technological improvements.
-  The global bus fleet is around 3 million in number. Battery electric buses (BEBs) make up 13% (390,000 BEB's) of the global bus fleet of which 99% are in China and **only 1,560 BEBs in Europe.**
-  Globally there are **less than 1000 fuel cell electric buses (FCBs).** Europe is currently at the forefront with 400 buses to be operational in the early 2020s (thanks to the JIVE and JIVE 2 initiatives and other FCH JU funded projects). Following on from this, a 600 FCB project has been awarded, deploying 600 buses and supporting infrastructure in Denmark, Latvia and the UK (~40m€ CEF funding) - but China is catching up rapidly with plans to deploy 14,000 FCBs in Schenzen.
-  **BEB's and FCB's are complementary technologies** and suitability depends on the local situation. In city centres, BEB's with fast and slow charging can cover shorter routes; while FCB's work best on longer routes, and where operational flexibility is required.
-  As BEB production is scaling up, the prediction is that **electric buses can reach cost parity with diesel buses by 2030.**
-  The top pre-requisites for implementing ambitious plans are the presence of **strong political support**, peer-to-peer visits on sites where zero emission buses are trialled, and availability of low cost local energy.
-  Europe is ready for manufacturers to bring zero emission products to the market now.

### KEY SOLUTIONS FOR CHALLENGES IN THE PROCUREMENT OF ZERO EMISSION BUSES:

-  The cost for a BEB single deck bus ranges from **€300,000 - €500,000.** The solution to unlocking lower prices is producing buses on a large scale.
-  The cost of a FCB single deck is capped at **€625,000** today (within the JIVE 2 project), but an indicative purchasing price below €450,000 is already seen today. Like BEBs, further reductions for FCBs can be unlocked through economies of scale.
-  At European level, finance schemes exist to support the uptake of zero emission technologies with grants such as the CEF funding or loans via the EIB (these schemes have co-financed 850 e-buses up until now).

- 🚌 There is no silver bullet for the **best ways to procure** the buses. In most of the cases, tenders are open to all technologies and the zero emission technologies were chosen for their specific merits. Think big picture: include all costs in the tender, focusing on TCO instead of solely including purchasing costs (CAPEX).
- 🚌 **New business models** are being offered by suppliers that cover the ‘complete package’ including the bus, infrastructure, and fixed electricity or hydrogen price. Increasingly OEMs are becoming service partners by offering extended guarantees, a full maintenance contract, leasing, and work on predicting battery faults.
- 🚌 **Learn from the experiences of previous projects**, gather data from existing operation and assess the specific needs (topography, length of the line, power needed) to understand which technology would be the best fit for the route in question. Support a technology neutral decision-making process, plan the infrastructure deployment in parallel, train staff in advance of bus operation.
- 🚌 Rely on information given on the technology performance, the products are ready, finance agencies are ready to support with loans and grants.

#### KEY SOLUTIONS FOR CHALLENGES IN THE OPERATION OF ZERO EMISSION BUSES:

- 🚌 Large amounts of electricity are needed to recharge a whole BEB fleet, often during peak charging hours. BEB depots need to be optimised – with overnight charging, peak charging hours can be avoided and costs reduced.
- 🚌 **Standardisation** of charging infrastructure and routines are required to allow **interoperability** – the standard on fast-charging is being developed (expected 2019-2020).
- 🚌 The main challenges for BEBs are the impacts on **grid capacity**. Lessons learnt from the Netherlands: accept a transition period before full operation, a depreciation and concession period of 15 years and collaboration with energy suppliers/utility ahead of the beginning of operation.
- 🚌 **Scaling up and the green hydrogen (H2) infrastructure challenge**: From green sources, total H2 production costs are still relatively high. In 2015, these costs amounted to 2.4€-3.3€/kg before transportation. Suppliers are aiming to reduce these costs to 1.3€-2.7€/kg by 2020, but these cost reductions can only be achieved. This is then competitive with small fossil fuel-based hydrogen production, as H2 price will become much lower (8.5€/kg at the nozzle including production, transport and tax for 10 buses and 5€ for 100 buses), reaching cost parity with diesel. **Scaling up** will also drastically reduce maintenance costs.
- 🚌 Tax incentives for green electricity are critical to make the H2 option competitive. The main cost driver is the electricity price – at 50-55€/MWH H2 production will be at parity with diesel.
- 🚌 Tackling the large footprint of hydrogen at bus depots: start with combined hydrogen refuelling stations for buses and cars or multifuel stations as a way to **lower the costs**. 2t H2/day = 70-100 FCB buses; on site storage footprint can be reduced already today.
- 🚌 We need **green hydrogen** and **green electricity** today. To achieve this, we need to look at sectoral integration and the source origin of the energy.

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