

On the buses - Europe's Zero Emission Urban Bus System project



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Europe's Zero Emission Urban Bus System project hopes to reduce emissions, improve air quality and lower noise levels across the continent by bringing electric bus systems to the heart of the transport network. Elly Earls meets the project's coordinator, Umberto Guida, to find out how.

The first-of-its-kind European Commission-funded Zero Emission Urban Bus System (ZeEUS) project will test ten different electric bus technologies across nine European cities by 2017, with the ultimate aim of bringing electric systems to the heart of the continent's urban bus network. However, it won't be an easy task. Not only is there a plethora of logistical and operational challenges involved in introducing electric bus systems on a large scale, but standards also need to be developed – quickly – if there's any chance of the market growing to its full potential.

Although Europe is slowly moving towards cleaner buses – Barcelona, for example, boasts 132 operational hybrid buses, while Warsaw's fleet includes electric and hybrid buses, as well as vehicles running on LNG or equipped with solar panels – electric buses are still a very small proportion (1–2%) of the continent's total fleet. The majority (90%) is still made up of diesel and biodiesel buses, while overall transport in Europe is still 94% dependent on oil, 84% of which is imported, adding up to a bill of up to €1 billion a day and resulting in increasingly costly effects on the environment.

It's little wonder that moving towards electric transport systems has become a key priority for the United Nations (UN), which launched the Paris Declaration on Electro-Mobility and Climate Change in 2015, and the European Commission, which, as just one part of its overarching objective to create a competitive and sustainable transport system by deploying alternative fuels, is funding the ZeEUS project.

Ten demonstration sites

The first step towards the ZeEUS project's central goal to bring electric solutions to the heart of Europe's urban bus network – thereby reducing emissions, improving air quality and lowering noise levels – is already under way in the form of ten demonstrations of different electric bus technologies and charging infrastructures across nine European cities, including London, Barcelona, Stockholm and Bonn.

As Umberto Guida, director of research and innovation at UITP, the international association representing public transport stakeholders, which is coordinating the ZeEUS project, explains, "Demonstrations of high-capacity ebuses [electric buses] are an innovative and necessary intermediate step to demonstrate the economic, environmental and social viability of systems of electric buses for mass commercialisation."

Different technologies being tested include overnight charging at the bus depot, wireless opportunity charging along the route and overhead contact line charging, but the aim is not to find one electric bus technology that should be introduced across the continent. Rather, the project wants to put different cities' decision-makers in the position to select the right solution for them; overnight charging may work in one city, for example, while opportunity charging could be a better solution for another. "There is no silver bullet – it doesn't exist," Guida stresses.

"It's really dependent on the type of operation, the type of line and so on."



Transport for London buses, which make up over 90% of current buses in the capital.



By 2025, electric buses are expected to comprise 40% of the fleets of the 18 European cities with transport strategies that exceed that point in time.

Because of this, different KPIs are being used to test and analyse the economic, social and environmental viability of each demonstration, although all have been chosen from the same KPI tree, which is based around the three pillars of sustainability: 'people, profit and planet'. Furthermore, as many common KPIs as possible were encouraged, so that comparisons could be made between the different sites.

"ZeEUS is the very first project of its kind to test and validate a wide range of electric bus technologies with different fast and slow-charging strategies, and energy supply modes," Guida notes. "Not only are the buses running in full operational conditions, but they are running in varying geographical climatic and operational conditions across the different demonstration sites that will bring invaluable results and experiences."

If, how and when

As well as conducting live demonstrations, ZeEUS is also in the process of developing guidelines and tools to help cities' public transport decision-makers determine 'if', 'how' and 'when' to introduce electric bus systems into their core urban network and, once they've found the right solution, how to plan its introduction.

"First, cities need to determine if electric buses are the solution for them, as there are also other alternatives, such as hydrogen or clean diesel," Guida notes. "Then they need to select which technology is best for them and learn how to introduce the new system."

The challenges involved in this process are significant. "For example, installing infrastructure for fast charging is extremely complex work in a city, as it requires lots of permission and authorisations, and can take a lot of time," Guida explains. "Indeed, installation of the infrastructure is the reason for some of the delays we have experienced in cities. So while the vehicle itself, in theory, is simpler than a diesel bus in terms of technology, installing the infrastructure requires a lot of administrative processes and the involvement of lots of different stakeholders, including the energy provider, which is not always already in a contractual relationship with the operator."

Alongside this, ZeEUS, together with the European Commission, hopes to develop material to help stakeholders specifically with the procurement process for electric bus systems. "With diesel buses, you just need to do a tender and ask for the vehicles, but for electric buses the procurement is done in terms of systems, a bit like with trams. You need to procure a vehicle, but you also need to procure the infrastructure," Guida notes, adding that the fact that so many stakeholders having been involved in the project from the outset will make the development of these guidelines much easier.

"Introduction of the electric buses is a complex process that requires multiple changes on different levels – production, adaptation of the line and depot infrastructure. We have gathered the entire stakeholder spectrum in order to ensure that the demonstrations are prepared and conducted in the best way possible. By including each group in the discussion about the electric propulsion, we hope to develop tools and guidelines that can be adopted for further procurement and operation of the ebuses in other cities."

Standardisation: crucial for market growth

Another big area the ZeEUS team, as well as the wider UITP, has been working on is standardisation; without this, Guida stresses, there is little hope for the electric-bus-systems market to grow to its full potential. This is because the introduction of electric-bus networks tends to be done in stages, all of which start with a competitive tender, and there is no way to

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guarantee that the provider that wins the first tender will be chosen to work on the next stage of the network as well.

“Cities cannot explicitly select the solution they have on one line for another and the problem then, of course, is that the two solutions need to be compatible and interoperable,” he notes. “A real market isn’t going to grow if the industry does not reach a level of standardisation between solutions.”

Fortunately, progress is already being made on this front; indeed, through a joint effort, ZeEUS, the Association of German Transport Companies (VDV) and UITP have already delivered material to CEN/CENELEC, the European body for standardisation, which will be the base for developing the new standard. Yet, as this is unlikely to be ready before 2019, a group of manufacturers and technology providers are also working on developing an industrial standard that can be used in the interim.

“The industry wants to have something sooner because the market is growing now and users don’t want to wait until 2019 to start deciding,” Guida says.

Recent research shows that the global market for electric and hybrid-electric buses offers significant growth potential, with a projected annual growth rate of 17% from 2016 to 2021. Meanwhile, ZeEUS’s own analysis has revealed that uptake of electric buses, while it may be slow over the next four years, is set to take off post-2020.

According to the team’s analysis of Europe’s most forward-thinking countries’ clean transport strategies, by 2020, 7% of the bus fleets of 25 European cities (those that have a strategy up to 2020, including Paris, Bonn, Amsterdam and Oslo), will be electric, while just five years later, electric buses are set to make up an impressive 40% of the fleets of the 18 European cities with strategies that reach 2025.

“By 2020, there will only be a low growth of electric buses because all the barriers will still be in place, such as funding, and the knowledge gaps when it comes to things like the lifetime of batteries and how to update depots for electric buses,” Guida notes. “However, by 2025, the assumption authorities have is that these problems will largely have been solved.”

The team at the ZeEUS project, in collaboration with governments, technology providers and the European standardisation authority, is clearly working hard to address them. If these figures are met, it would be a significant step towards ZeEUS’s goal of bringing electrification to the heart of Europe’s urban bus network.

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