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Barcelona unveils two electric articulated buses and one en route rapid-charging station

The new Solaris Urbino, the first 18-meter 100% electric bus in Spain, will soon be serving the H16 route

Endesa built a charging station on Carrer del Cisell capable of filling bus batteries on service adjustment stops

Barcelona increases its zero-emission bus testing within the ZeEUS project, which began in 2014 with two standard vehicles

The city continues to lead the way in clean urban transport research with EU's support and UITP's collaboration

Two new electric articulated buses were presented today in Barcelona within the framework of project ZeEUS (Zero Emission Urban bus System) funded by the European Union and coordinated by the International Association of Public Transport (UITP). The ZeEUS project consists of a battery of intensive tests with electric buses or last generation plug-in hybrid vehicles that take place in ten different cities to give a decisive boost to research and innovation in clean technologies applicable to public transport. Transports Metropolitans de Barcelona (TMB) leads the trials in Barcelona in partnership with manufacturers Irizar and Solaris and the energy company Endesa, and the collaboration of Enide, the Polytechnic University of Catalonia, Idiada and GMV.

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Technology serving the environment

Barcelona broadens its involvement in researching cleaner technologies applied to urban public transport by initiating a second testing phase with zero-emission buses within the project ZeEUS. These buses, two articulated Solaris Urbino E, are the first 18-meter pure electric vehicles in Spain and are able to charge batteries while en route at a station built especially by Endesa in the Zona Franca, near the end of bus route H16 where these buses will be serving.

Exterior and interior of one of the Solaris Urbino 18E buses added to the TMB fleet this year

In 2014, Barcelona was the first out of a group of European cities selected to participate in project ZeEUS to begin street trials with pure electric buses in order to gather data to help manufacturers improve the vehicles. Tests were conducted on two 12-meter Irizar i2e buses (equipped with overnight rechargeable batteries) that regularly and reliably served TMB routes 20 and 34 and participated in a large number of outreach social campaigns about the environmental benefits of electrification of public transport.

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The second part of Barcelona's participation in project ZeEUS involves the use of two buses of different sizes and technologies. Built in Poland by Solaris, these two 18-meter articulated buses, with a capacity of 110 passengers, are powered by 270 kW electric motors and equipped with three two-speed batteries —slow charging at the garage and rapid charging en route. As a result, the bus is able to perform well with smaller batteries (120 kWh) and less weight, which makes it more efficient.

Like all units of TMB's fleet, the Solaris Urbino E18 have been designed to meet the usual operability requirements: 16 continuous hours at full load with air conditioning on during summer months and the usual comfort features for passengers (low platform, 37 seats, two spaces for disabled passengers, ramp, onboard information systems, USB sockets to charge mobile devices...). Like all articulated buses purchased since 2015, these units have four doors, which allows for loading passengers through the two at front.

Charging by pantograph

The technological innovation of this second round of testing is the charging system of the buses. It consists of a retractable pantograph located at the top of the body.

The pantograph charging system consists of two elements.

On the one hand, the charger, which is like a mast of about five meters high similar to a lamppost, located near the last stop of the route where the vehicle usually stops briefly due to bus transit adjustments before resuming its service. In this case, the charging infrastructure built by Endesa is located on Carrer del Cisell, a few meters away from a terminus of the route H16.

On the other hand, there is what is properly called the pantograph, a retractable mechanical arm attached to the roof of the bus. It unfolds and connects to the charger that hangs over the bus in order to begin charging the battery while the vehicle is parked.

Bus parked under the heavy-vehicle charger on Carrer del Cisell

This system, also known as an Opportunity Charging System, allows to fill up to 80% of the vehicle's battery, which always remains above 40%, within 5 to 8 minutes thanks to the 400 kW charging

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power of the charger. Also, it feeds Endesa's control centre with data, which is shared with the Regulation and Operations Center. Such data allows real-time activity monitoring of the charger and informs of the status of the connected vehicle. Indeed, very useful information for the operation of TMB's fleet.

The pantograph connects to the top part of the rapid charge station
On the right, a view of the on-roof retractable arm of the Solaris Urbino 18E

The bus has two different sensors. On the front side, there is the approach sensor. It alerts the system that the bus is nearing the charger and prepares it to engage. On the back, there is the position sensor. It tells the pantograph arm it can be unfolded to connect to the charger and proceed with filling up the battery.

This charging system provides sufficient power so the bus can resume its route, always keeping the battery meter between 40% and 80%. In addition to this pioneering station, Endesa has built two nighttime FASTO charging stations in TMB's bus garages to top up the batteries to a 100% within an estimated time of two to three hours.

Fully operational for passengers in November

Both the buses and the rapid-charging system are now entering a trial period. Within two months, approximately, both electric articulated vehicles will join the H16 route (Pg. Zona Franca - Fòrum) of the new bus network as reinforcements.

Subsequently, TMB will build a second rapid-charging station at the Fòrum, which will complete the power supply of two buses en route and allow them to be included as full-fledged vehicles of the route.

Ten participating European cities

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Project ZeEUS, in development between November 2014 and April 2017, includes similar tests in nine cities: Muenster and Bonn, Germany; Randstad in the Netherlands; London, Great Britain; Paris, France; Cagliari, Italy; Stockholm, Sweden, Pilsen, in the Czech Republic, and Warsaw, Poland. Local operators are testing a total of 60 pure electric buses, trolleybuses or plug-in hybrids, built by six European manufacturers. The project, funded by the EU's Seventh Framework Programme for Research (FP7) has a budget of 22.5 million euros, of which 13.5 correspond to European funds.

Barcelona's bus fleet conversion to protect the environment

Since 2012, Barcelona buses have been at Europe's forefront because of their low emission levels of gases and harmful particles. A feat that has been accomplished by using compressed natural gas and the massive installation of anti-contamination filters. Now, through the progressive electrification of the fleet, they seek to limit emissions of greenhouse gases that contribute to global warming. Currently, TMB's fleet has 159 hybrid vehicles and 5 pure electric ones.

Under 2016's approved renovation plan, TMB will acquire another 50 hybrid vehicles (40 articulated and 10 standard) and is expected to reach the 300-unit mark –in a fleet of 1.050– in four years. The goal is to continue the preservation of the environment and foster fleet efficiency by helping the automotive industry advance towards a completely clean public transport.

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