

Barcelona (ES)

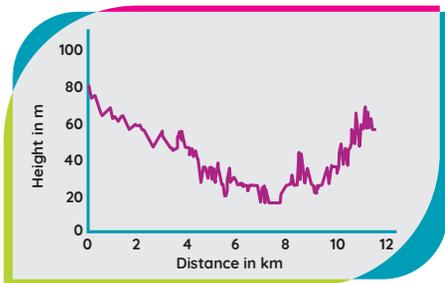
DESCRIPTION

The ZeEUS Demonstration in Barcelona is investigating the feasibility of two opportunity-charged 18m articulated buses and two overnight-charged 12m buses.

The 18m buses are charged at the depot for 2-6 hours and run under normal Barcelona conditions for 16 hours.

The opportunity-charged buses recharge their batteries each 12km (half of the route) to up to 80% of total capacity. This allows the buses to run all day.

The test in hilly routes shows that consumption is similar to that on flat routes. The energy consumed ascending is almost completely recouped when descending.



Elevation map of the line route L34



Elevation map of the line route H16

OPERATIONAL CONDITIONS

Line number: H16, L34

Typology: City centre

Topography: Flat

Length: H16: 12km; L34: 12km

Average commercial speed: 11km/h

Total daily hours of operation: 16h

Total km driven/vehicle/day: 180km

Av. no. of passengers/day: 650 passengers

SORT type: 1



Solaris E18

DEMO IN BRIEF

Vehicle technology:

2 x Full Electric

Brand and model:

Solaris E18

Bus length: 18m

Capacity: 115 passengers

Charging technology:

Opportunity

Duration:

From May 2016 and ongoing

Vehicle technology:

2 x Full Electric

Brand and model:

Irizar i2e

Bus length: 12m

Capacity: 75 passengers

Charging technology:

Overnight

Duration:

From Sept 2014 and ongoing

KEY TOPIC

The idea is to test the viability of operating these types of buses in warm Mediterranean weather and to test the two charging strategies.

TMB's objective is to evaluate the reliability and feasibility of this solution. It will provide information that allows comparison of total cost of ownership, operational requirements, limitations and opportunities offered by these charging strategies.

DEMO TIMELINE •

- Oct 2016 - Solaris test ride
- Sept 2016 - Fast charger installed
- May 2016 - Fast charger reception
- Sept 2014 - Irizar start of operation
- March 2016 - Solaris bus reception
- Aug 2014 - Irizar bus reception



Irizar i2e

FIGURES FOR THE BARCELONA DEMO FROM AUGUST 2014 TO AUGUST 2017



62,039 litres¹

The amount of diesel fuel saved by the ZeEUS bus project

¹ Assuming 38l/100 km



163,260km

The distance travelled by ZeEUS buses running in pure electric mode



89,441 kg²

The amount of carbon dioxide emissions prevented by the ZeEUS bus project

² ISO 16258 factor for Diesel and GaBi factor for EU electricity grid mix (2014)

RESULTS AND LESSONS LEARNED •

- Currently, opportunity charging is the best option for TMB operations. However, the costs and delays of infrastructure installation are the next challenge. Working hand-in-hand with city council is essential.
- Powertrain, batteries and motors technologies are sufficiently mature to allow implementation.
- Batteries lose power at the predicted rate; LTO batteries provide the optimum solution for opportunity charging application
- 'Zebra' (Sodium Nickel Chloride) batteries lack reliability.

“Opportunity charging is the best solution for TMB. Urban route conditions offer the ideal environment to realise the advantages of electric buses.”

Mario Canet, Engineering New Development Responsible, Transports Metropolitans de Barcelona

FUTURE PLANS •

Electrify new lines with opportunity charging; ‘wait and see’ for overnight charging.

In July 2018, TMB will receive seven 18m articulated e-buses from Irizar and Solaris with opportunity charging.

In 2019, line H16 will be fully electric (with 22 buses) and TMB will begin electrifying another line.

www.zeeus.eu



enide



Applus⁺
IDIADA



The ZeEUS project is coordinated by UITP. ZeEUS is co-funded by the European Commission under the 7th Research & Innovation Framework Programme, Mobility & Transport Directorate General under grant agreement n° 605485. The ZeEUS project has been launched by the European Commission in the frame of the European Green Vehicle and Smart Cities & Communities.

