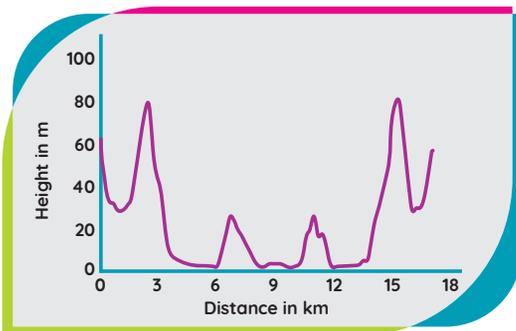


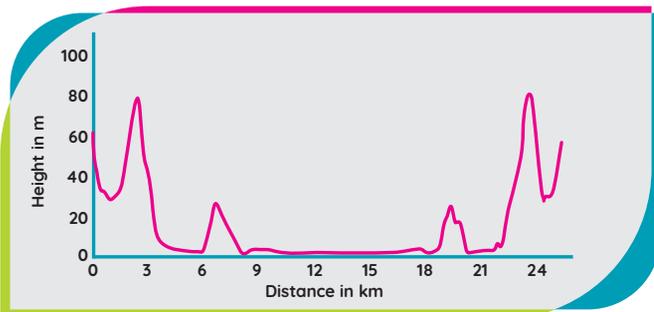
# Cagliari (IT)

## DESCRIPTION

CTM evaluated the performance (efficiency, reliability, etc.) of six battery trolleybuses against both traditional trolleybuses of the same brand and model equipped with a diesel auxiliary power unit (APU) and diesel buses. The demo was undertaken during normal service (line 5-ZeEUS) using all vehicles simultaneously. A section of the route was driven using the trolleybuses with the auxiliary system only (batteries, diesel APU).



Elevation map of the line route - winter configuration



Elevation map of the line route - summer configuration

## OPERATIONAL CONDITIONS

**Line number:** Line 5 ZeEUS

**Typology:** City centre – suburban (seafront road)

**Topography:** Moderate

**Length:** 17.1km (winter configuration),  
25.6km (summer configuration)

**Average commercial speed:** 13.3km/h

**Total daily hours of operation:** 15 - 18h

**Total km driven/vehicle/day:** 180 - 220km

**Av. no. of passengers/day:** 8,000 passengers

**SORT type:** N/A



Kiepe Van Hool A330T while running the Line 5-ZeEUS by batteries

## DEMO IN BRIEF

### Vehicle technology:

6 x Battery Trolleybuses

### Brand and model:

2 x Solaris Trollino T12,  
4 x Kiepe - Van Hool A330T

**Bus length:** 12m

**Capacity:** 82-86 passengers

### Charging technology:

Trolley poles (in-motion  
charging – at charging station)

### Duration:

March 2016 – Sept 2017

## KEY TOPIC

The core of the Cagliari Demo test was to assess the technical-economic feasibility of trolleybuses. Equipping these vehicles with traction batteries provides all the advantages of trolleybuses - less noise, no local pollution, lower energy costs, etc. - with the flexibility of traditional buses.

With a properly-designed system of vehicle and charging infrastructure, battery trolleybuses make it possible to extend the full-electric public transport service without the need to install new infrastructure such as overhead lines. This brings environmental benefits, with significant savings in investment costs and implementation times.

## DEMO TIMELINE •

- **Sept 2017** - end of Cagliari Demo test
- **April 2017** - Demo test extension
- **August 2016** - charging station completed, start of service of four Kiepe-Van Hool A330T
- **March 2016** - start of the Cagliari Demo Test with entry into service of two Solaris Trollino T12



Solaris Trollino T12 while running the Line 5-ZeEUS by batteries

## FIGURES FOR THE CAGLIARI DEMO FROM MARCH 2016 TO SEPTEMBER 2017



**131,837 litres<sup>1</sup>**

The amount of diesel fuel saved by the ZeEUS bus project

<sup>1</sup> Assuming 38l/100 km



**346,940 km**

The distance travelled by ZeEUS buses running in pure electric mode



**105,100kg<sup>2</sup>**

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

<sup>2</sup> ISO 16258 factor for Diesel and GaBi factor for EU electricity grid mix (2014)

## RESULTS AND LESSONS LEARNED •

- During 501-day test period, the battery trolleybuses covered around 346,944km, including 95,865km by battery.
- The reliability of the battery trolleybuses proved excellent, with reliability values comparable to CTM's existing bus and trolleybus fleet
- Energy consumption is considerably lower than diesel buses and traditional trolleybuses
- According to a number of surveys, the passengers appreciate the ZeEUS project and the battery-driven trolleybuses
- The battery trolleybus is a viable and mature technical option that is reliable, flexible and clean

"The participation of CTM in the ZeEUS project represents a major step towards transforming the city and in improving citizens' quality of life."

Massimo Zedda, Mayor of Cagliari

## FUTURE PLANS •

Future plans envisage using battery-powered trolleybuses and associated infrastructure for regular transport services.

CTM will use the results of the trial to improve various aspects (procurement, maintenance, etc.) and to design extensions to the trolleybus network in areas where the catenary is not available.

[www.zeeus.eu](http://www.zeeus.eu)



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