London (UK)

DESCRIPTION

As part of the ZeEUS project, the London demo trialled three plug-in electric-diesel hybrid double-decker buses on route 69. These ran between two major city transport hubs, Canning Town Bus Station and Walthamstow Central Bus Station.

The buses charged wirelessly at either end of the route, where they were parked over a 100kW charging plate. In addition, the batteries were fully charged by overnight plug-in charging at the bus station.

Map of the line route

Bus positioning for charging

DEMO IN BRIEF

Vehicle technology:
3 x Plug-in Hybrid-drive electric range extender

Brand and model:
Alexander Dennis, E400 VE

Bus length: 10.3m

Capacity: 83 passengers

Charging technology:
Overnight plug-in charging, and route termini inductive wireless charging

Duration:
Nov 2015 - April 2017

OPERATIONAL CONDITIONS

Line number: 69

Typology: City Urban

Topography: Flat

Length: 11km

Average commercial speed: 12km/h

Total daily hours of operation: 16h

Total km driven/vehicle/day: 160km

Av. no. of passengers/day: 26,966 passengers

SORT type: N/A

KEY TOPIC

Approximately two-thirds of the London bus fleet is in double deck configuration. This poses a technical challenge for pure electric vehicles, given the current state of battery technological maturity. Although permissible maximum gross vehicle weight has now been increased to 19,500kg, this still presents significant challenges in maintaining passenger capacities while carrying sufficient battery capacity to achieve and maintain route schedules.

DEMO TIMELINE

- **April 2017** - buses transition from demonstration trial status and into normal operation
- **April 2016** - Entry into service
- **April 2016** - Acceptance testing
- **Jan 2016** - First reporting
- **Dec 2015** - Official launch
- **Nov 2015** - All buses delivered
- **Oct 2015** - ADL delivery, driver and engineering training

Official Launch of the London Demo

FIGURES FOR THE LONDON DEMO FROM APRIL 2016 TO DECEMBER 2016

16,592 litres[1]
The amount of diesel fuel saved by the ZeEUS bus project

[1] Assuming 38l/100 km

43,664km
The distance travelled by ZeEUS buses running in pure electric mode

33,582kg[2]
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

- The project achieved more than 60% in EV mode. This can be further improved by consistent overnight top-up charging at the bus garage.
- Improved understanding of the plug-in range extended wireless charged bus technology, and its operational performance.
- Positive feedback from both drivers and passengers.
- Installing the charging infrastructure proved to be the greatest challenge.
- A great deal of the demonstration trial focused on optimising technology performance; there will be equal focus on the human aspects in future trials

"The demonstration trial provided TfL with a valuable opportunity to run wirelessly-charged buses under real world operating conditions. The lessons learned will inform London's future zero-emission bus strategy."

Colin Gerald, Engineering Manager, TfL

FUTURE PLANS

The buses and infrastructure will continue to operate in service to test operational performance and durability further. A key design requirement for future solutions will be charging interoperability, providing the flexibility to move buses between routes.

A number of different charging solutions and strategies, such as opportunistic high-power induction (wireless) and conductive (pantograph) charging solutions, will be explored further to optimise and extend the range of the electric double-deck bus configuration.

www.zeeus.eu

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