STOCKHOLM (SE)

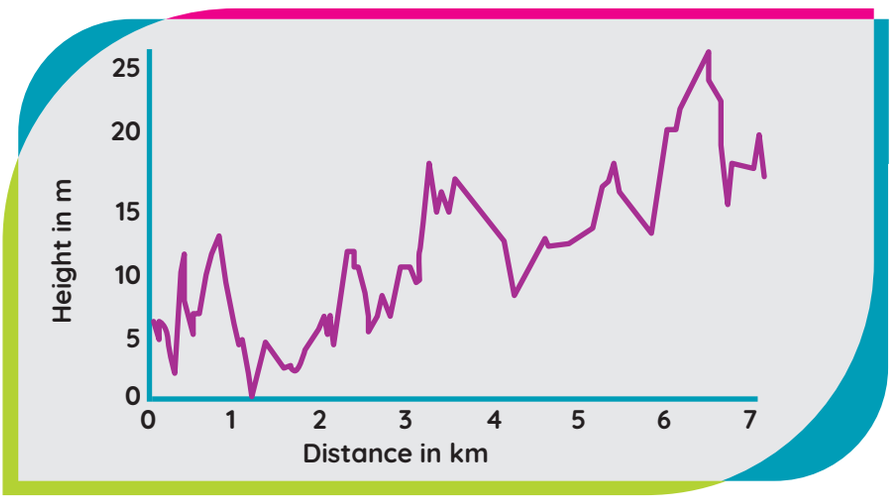
Two Volvo Electric hybrid buses driving in Stockholm

DESCRIPTION

This was part of the EU-funded ZeEUS project led by UITP. Volvo, Vattenfall, Viktoria ICT and Stockholm County cooperated to demonstrate eight opportunity-charged electric hybrid buses.

The demonstration was in standard traffic conditions, replacing existing Keolis-operated buses on route 73 in central Stockholm.

The objective was to demonstrate these buses in public transport operations with low emissions, energy consumption and noise levels while maintaining high performance and cost efficiency.



Elevation map of the line route

DEMO IN BRIEF

Vehicle technology:
8 x Plug-in Hybrid Electric

Brand and model:
Volvo 7900 Electric Hybrid

Length: 12.13m

Capacity: 71 passengers

Charging technology: Two opportunity fast chargers with descending arm pantograph

Duration:
March 2015-Dec 2016

OPERATIONAL CONDITIONS

Line number: 73

Typology: City centre

Topography: moderate

Length: 8.5km

Average commercial speed: 12km/h

Total daily hours of operation: 14h

Total km driven/vehicle/day: 124km

Av. no. of passengers/day: 4,654

SORT type: SORT 1, Urban

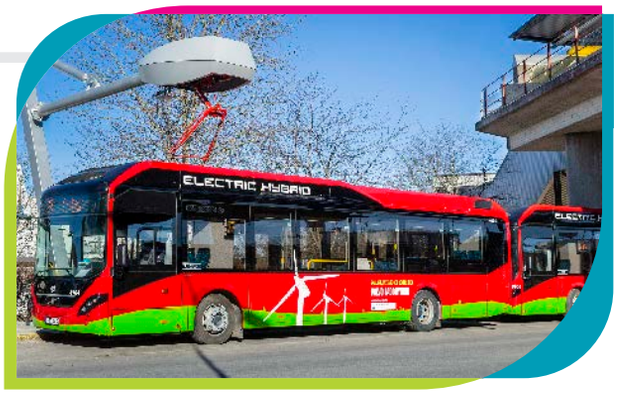
KEY TOPIC

The demonstration in Stockholm focused on testing an automatic fast-charging bus with a pantograph on a charging pole at each end of the route combined with overnight charging at the depot.

In addition, the demo explored the possibility of operating a plug-in hybrid bus on a combination of electricity from wind power and 100% HVO (hydro-treated vegetable oil).

DEMO TIMELINE

- **Dec 2016 -** end of operation
- **April 2016 -** second charging station operational
- **Nov 2015 -** construction of second charging station begun
- **April 2015 -** all eight buses operating in full traffic
- **March 2015 -** start of operations
- **March 2015 -** first charging station operational
- **Sept 2014 -** construction of first charging station begun
- **Dec 2014 -** first bus operational
- **Nov 2013 -** start of project



Charging Volvo Electric hybrid bus at the end station of route 73, at Ropsten in Stockholm

FIGURES FOR THE STOCKHOLM DEMO FROM MARCH 2015 TO DECEMBER 2016

61,015 litres[1]
The amount of diesel fuel saved by the ZeEUS bus project

[1] Assuming 38l/100 km

160,565km
The distance travelled by ZeEUS buses running in pure electric mode

170,163kg[2]
The theoretical[3] amount of carbon dioxide emissions prevented if fossil diesel had been replaced

[2] ISO 16258 factor for Diesel and GaBi factor for EU electricity grid mix (2014)
[3] Low actual reduction due to ZeEUS buses replaced biogas buses

RESULTS AND LESSONS LEARNED

- The buses and the charging functions exceeded expectations
- Approx. 27,000 fast-charging sessions
- Physical size of charger and pole combined with local underground conditions created problems. Charging can be difficult in the city centre
- As this technology is new, not all aspects are currently regulated. This means certain regulations need to be cleared with responsible authorities during the course of the project
- We recommend that other cities planning for similar projects pay special attention to the charging infrastructure installation

"The ZeEUS Stockholm demonstration provides valuable input to SL´s work planning for future implementation of electric buses in Stockholm"

Maria Övergaard, Project Manager, SL

FUTURE PLANS

- Continued operation with 100% renewable fuels
- Stepwise electrification of the 2,100 buses in the county
- Focus on electrification in next inner city contract beginning 2022 or 2026
- The majority of electrified bus development is currently in city buses, making it harder to create operational electrified solutions for suburban buses designed for highways. This will be a next step

www.zeeus.eu

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.