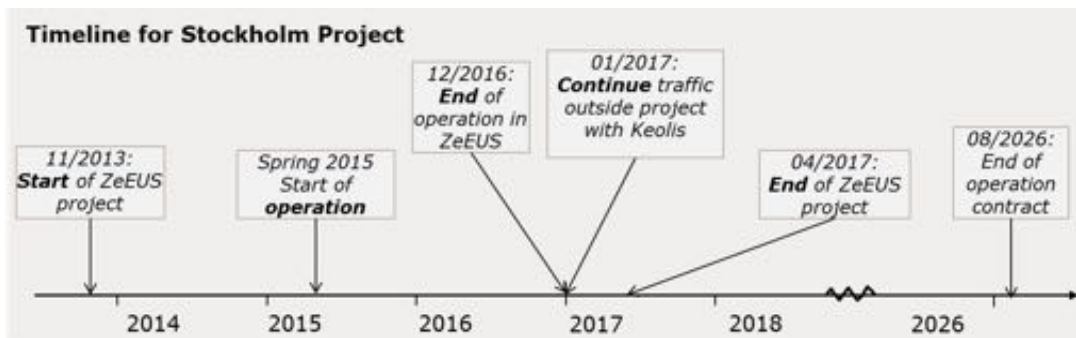




## ZeEUS Electric Hybrids demonstrated in Stockholm

- As a part of the EU-project ZeEUS, lead by UITP, Volvo, Vattenfall, Viktoria ICT and Stockholm County cooperates in demonstrating **eight opportunity charged electric hybrid buses**
- Functioning in **full scale traffic conditions**, same contractual terms as other traffic, and replacing the existing buses on route 73 in central Stockholm
- Objective of the project is to demonstrate buses in public transport with low emissions, energy consumption and noise level while **maintaining high performance and cost efficiency**
- Results and experiences in project will be **input to plans** regarding environmental targets and further electrification of buses in Stockholm County



## Route 73 Ropsten – Karolinska approx. 8,5 km



### Route 73

- Inner city route with very high visibility
- Route go through N:a Djurgårdsstaden, residential area with high environmental profile
- Passes Royal Institute of Technology
- Connects to Odenplan, a major traffic hub
- Through new business area Hagastaden
- End stop at Medical University of Karolinska

## Bus and charging

### *Electric Hybrid*

- **Electric drive** is approx. **7 km** governed by geo-fencing
- Approx. **6 min recharging** at end stations
- **Energy saving** approx. **-60%** on a 10 km route compared with a diesel bus\*
- **CO2** reduction approx. **87%\*\***
- **Low noise** and no exhaust emissions when driving in electric mode
- **Automatic** charging with **Pantograph**
- **Night charging** at the depot.
- The bus **can be driven as a normal hybrid** on routes without charging stations

\*Energy saving depending distance between charging, topography and climate

\*\*With Swedish electricity



The pantograph will be lowered automatically from the charging pole to connect to the bus, when bus driver stops at defined spot and pull hand brake



Night charger at depot

### *Charging*

- **Two charging stations**, one in each end of the route **150 kW**
- **Charging pole** approx. 5 m high at Ropsten
- **Transformer box** approx. 1,3x4,3x3 m
- Fast charging during stop at end station, **approx. 1 km electric drive per min charging**
- **Slow charging** during night at depot with cable connection mode 3, maximum **11kW**

## Some of the problems encountered - input to future projects

1. Preparation phase during **tendering** operation  
=> we could not plan the project with the operator before contract signed
2. Many requirements on **the route**, like visibility, place for charging, depot space, length of route, fits eight 12 m buses, route not to be changed during contract  
=> First choice not possible, hard to find new route
3. Tendering **rules differ** between companies and authorities and EU regulations have to be understood  
=> analysis needed before contract signed between project partners
4. Charging post require more **space** under ground than above  
=> could be difficult in central city

## Results

- First bus in operation since March 2015, all eight buses since April
- With one charging station, on approx. 17 km drive, in August 71 % of the time and 41 % of the distance was electric drive.
- Buses and charging functions above expectations
- When charging not possible the buses continues as non-charging hybrids
- **Welcome to ride the buses and tell us what you think!**

