

19th February, 2013, Brussels, Belgium

CHAdemo European Annual Conference 2013

Milestone toward achieving greener Europe

**CaetanoBus / Efacec
Cobus EL**



CHAdemo



Partnership CaetanoBus / Efacec



COBUS 2500 EL 100% ELECTRIC



Based on the Cobus airport buses



Some pre-series units tested in cities in Portugal and Germany, Wiesbaden and Offenbach and airports, Schiphol, Charles de Gaulle and Stuttgart.

One unit is presently running a long term test (3 years) in Finland

100% ELECTRIC BUS / COBUS 2500 EL



CAETANOBUS Scope:

- Chassis and Body
- Heating / Cooling System
- Low-Floor Chassis
- Aluminum Modular Structure
- CBCU – Central Body Control Unit (Body)
- Midi-urban 9-10 meters and urban 11-12 meters
- 2,55 meters wide (up to 3 m on airport versions)
- 18 ton GVWR
- Front-wheel drive

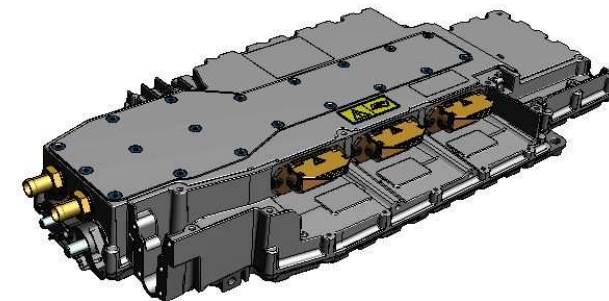
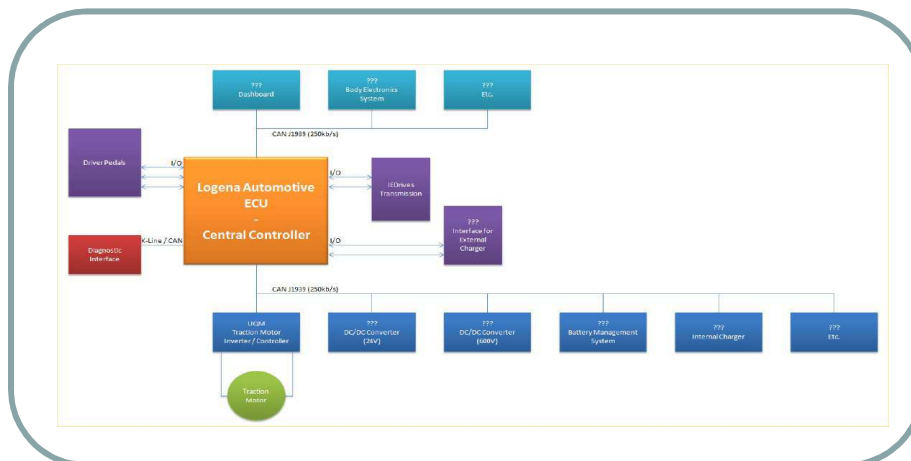
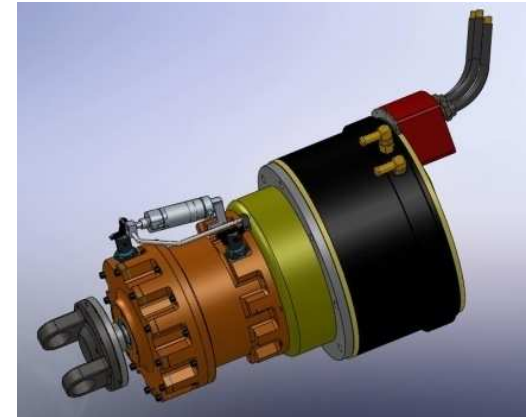


100% ELECTRIC BUS / COBUS 2500 EL



Efacec Scope:

- Energy and Power Train
- Continuous 120kW Permanent Magnet Motor
- 2 speed Automatic Gear-box, 3:1 and 1:1
- Motor Controller
- DC/DC and DC/AC Converters for Auxiliary Systems
- ECU – Electronic Control Unit (Energy & Traction)
- Internal Chargers (3 x 3,7 kW)
- Interface to CHAdeMO Quick Charger

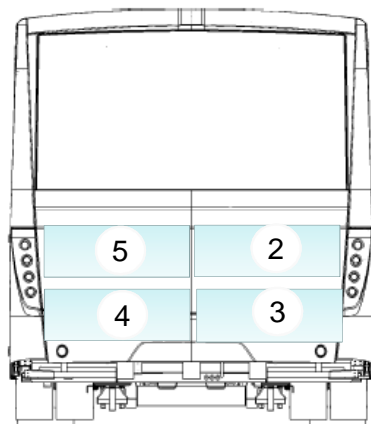


100% ELECTRIC BUS / COBUS 2500 EL

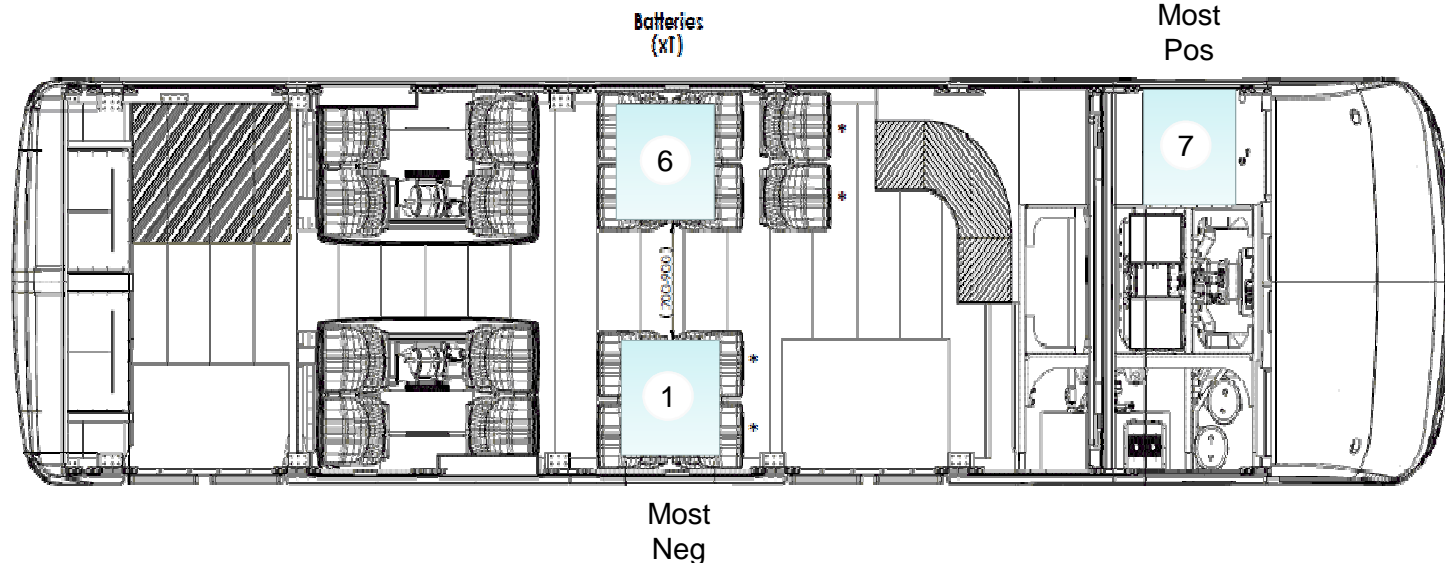


Efacec Scope:

- 150 kWh LiFePO4 Battery
- Batteries on side and back walls for easy access
- 120 Km autonomy
- Less than 3 hours 10-90% charge with QC50 (50kW)
- Over-night and balancing with 11kVA AC
- Roof Resistor Bank to burn regenerative braking energy when battery is full



Batteries (x4)



IEC61581 Mode 3 Charging



IEC 61851 Mode 3 for over-night battery charge and balancing up to 100% SOC

CHAdeMO Charging



CHAdeMO quick charger part of the Portuguese national EV charging infrastructure, MOBI-E.

Less than 3 hours to recharge from 10% to 90% SOC.



CHAdeMO Charging



Norway



GALP (Portugal)



South Africa



Madeira Island (Portugal)



Masdar City Abu Dhabi (UAE)



Chicago (USA)

Operation Data



Portugal

- **Where: Vila Nova de Gaia**
- **New line: up and down the avenue, frequent stops.**
- **Circuit Length: 4Km**
- **Average Energy (from charger): 1,2kWh/km (1,1 to 1,35) driver dependent.**
- **How: Two hours service, then quick charge for 30 minutes, then one hour and half service, then quick charge for 30 minutes, then one hour and half service.**

Germany

- **Where: Wiesbaden**
- **Bus taken from Wiesbaden to Offenbach, mostly in highway.**
- **Circuit Length: 40Km**
- **Average Energy (from charger): 0,91kWh/Km (no aux. systems on).**

Operation Data



Germany

- **Where: Offenbach**
- **Replaced existing passenger service: Line 103 between Offenbach and Frankfurt. Flat circuit with frequent stops at Offenbach and Frankfurt, but no stops between Offenbach and Frankfurt.**
- **Circuit Length: 30Km**
- **Average Energy (from charger): 1,35kWh/Km**
- **How: 2 circuits, then quick charge for about 2 hours and then 2 circuits**

Germany

- **Where: Wiesbaden**
- **Bus taken from Wiesbaden to Bingen, mostly in the highway**
- **Circuit Length: 41Km**
- **Average Energy (from charger): 0.77kWh/Km (no aux. systems on).**

From Now On



The Cobus EL 2500 is certified to run on regular roads, ready for market and series production.

One unit will be tested in Charles de Gaulle and Stuttgart airports

An off-road airport Cobus EL 3000 is on the track to be produced in 2013.



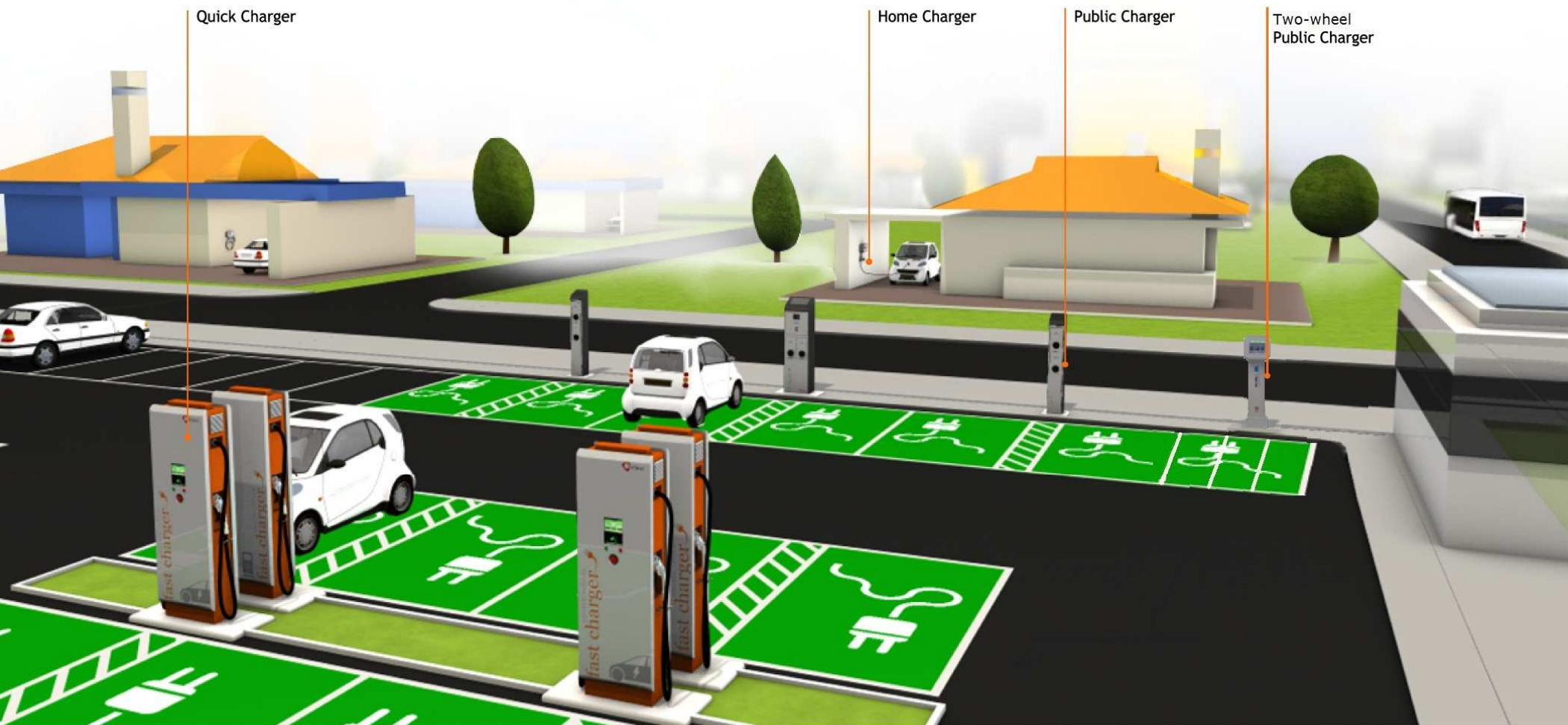
EFACEC OFFER EV Charging Solutions



Electric Mobility

Solutions

We believe in Electric Mobility as the future of urban mobility system for individual use. This is why Efacec has developed a full range of products covering all requirements of electric vehicle charging system - from Home Chargers to high power Fast Chargers, all according with the latest industry standards.



**Thank you and have a nice
journey on the
electric bus!**

