

# eBUS project status of the day

ECV – FIMA – TT syysseminaari

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## eBUS – Tekes funded project

- EV city bus test field and facilities
  - Unique test platform for EV city bus research
  - Test line including charging points (Friisilä - Tapiola), Veolia operate buses
  - Chassis dynamometer measurements at VTT – comparison database of over 100 city buses + follow ups with different fuels and technologies
  - Finnish challenging climate conditions – if the bus works in Finland it will work in most of places
- Budget ca. 4.6 M€



## eBUS test platform

- Research questions
  - Feasibility of electric buses
  - Real life energy consumption
  - Efficiency of components
  - Effects of driving conditions
  - Life cycle (especially batteries) and costs
  - Acceptance
  
- Four test platforms
  - Actual city bus test line (Espoo 11)
  - Laboratory for testing complete vehicles
  - Full-size test mule for testing components
  - Simulation tools

# First electric buses on eBUS project (Veolia) Caetano, BYD, Ebusco, more under negotiation

## BYD signs up Finland as electric bus customer

INDUSTRY NEWS | ASH | MARCH 13, 2012 AT 5:47 PM

Veolia, the Finnish public transport company, has inked a deal with **BYD** to supply electric buses to Espoo city, a suburb of Helsinki. As part of the agreement, Veolia Transport Finland will conduct real operations with **BYD** eBUS-12 in Espoo for three years. The Technical Research Centre of Finland (VTT) will take the role of monitoring and measuring during **BYD** eBUS-12's daily operations, so that EV buses can be verified as one of the key solutions for Veolia Transport Finland to ensure sustainable mobility.

Henry Li, Senior Director of **BYD** stated: "**BYD** is the significant project in Finland, which gives **BYD** reliable even in such harsh climatic conditions. **BYD** reduce pollution in large cities, reduce the operating costs. We believe that this project in Finland will be a big success for us."

The **BYD** eBUS-12 is able to run 250 km (155 miles) on a single charge.



Liikenne 26.11.2012 klo 8:55 | päivitetty 26.11.2012 klo 9:24

## Ensimmäinen sähköbussi starttaa liikenteeseen Espoossa

Helsingin Seudun Liikenteen sähköbussikokeilu käynnistyy tänään ensimmäisellä linjalla. HSL testaa eri valmistajien sähköbussien toimintaa Suomen kesä- ja talvioloissa lähivuosina.

Suosittelen 35 henkilöä suosittelee tätä.



Portugalilainen sähköbussi on ensimmäinen testijossa olevista ajoneuvoista. Kuva: Veolia

HSL:n ja Veolian ensimmäinen testikäytössä oleva sähköbussi starttaa tosi toimii maanantaina Espoossa. HSL testaa tulevana vuosina eri valmistajien sähköbusseja pääkaupunkiseudun liikenteessä. Ensimmäinen bussi kulkee Espoon sisäisellä linjalla 11.

## eBUS proto Vehicle Platform

- Kabus City Bus
  - Full aluminium lightweight body
  - Length 12 m
  - Weight just over 8000 kg including electric powertrain and excluding seats



 European Batteries

 **VACON**  
DRIVEN BY DRIVES

 **KABUS** 



 Metropolia

 **A!** Aalto-yliopisto

## City bus test mule Status

- Main powertrain fully operational
- Chassis dynamometer tests
  - Energy consumption
  - Efficiencies
- On-road, eBUS test line, Espoo line 11
  - Climate conditions
  - Operational verifications



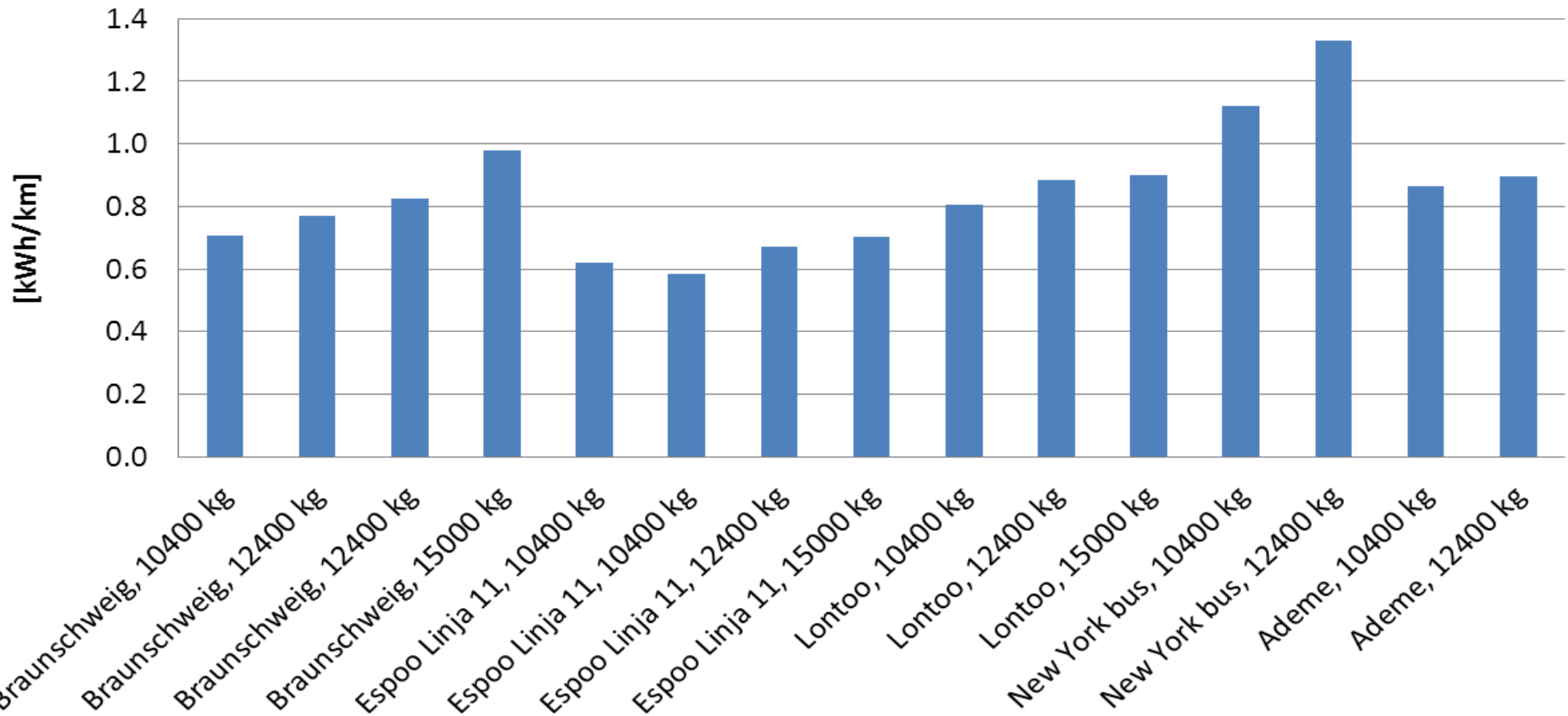
## Pre-results from laboratory tests (new methods)



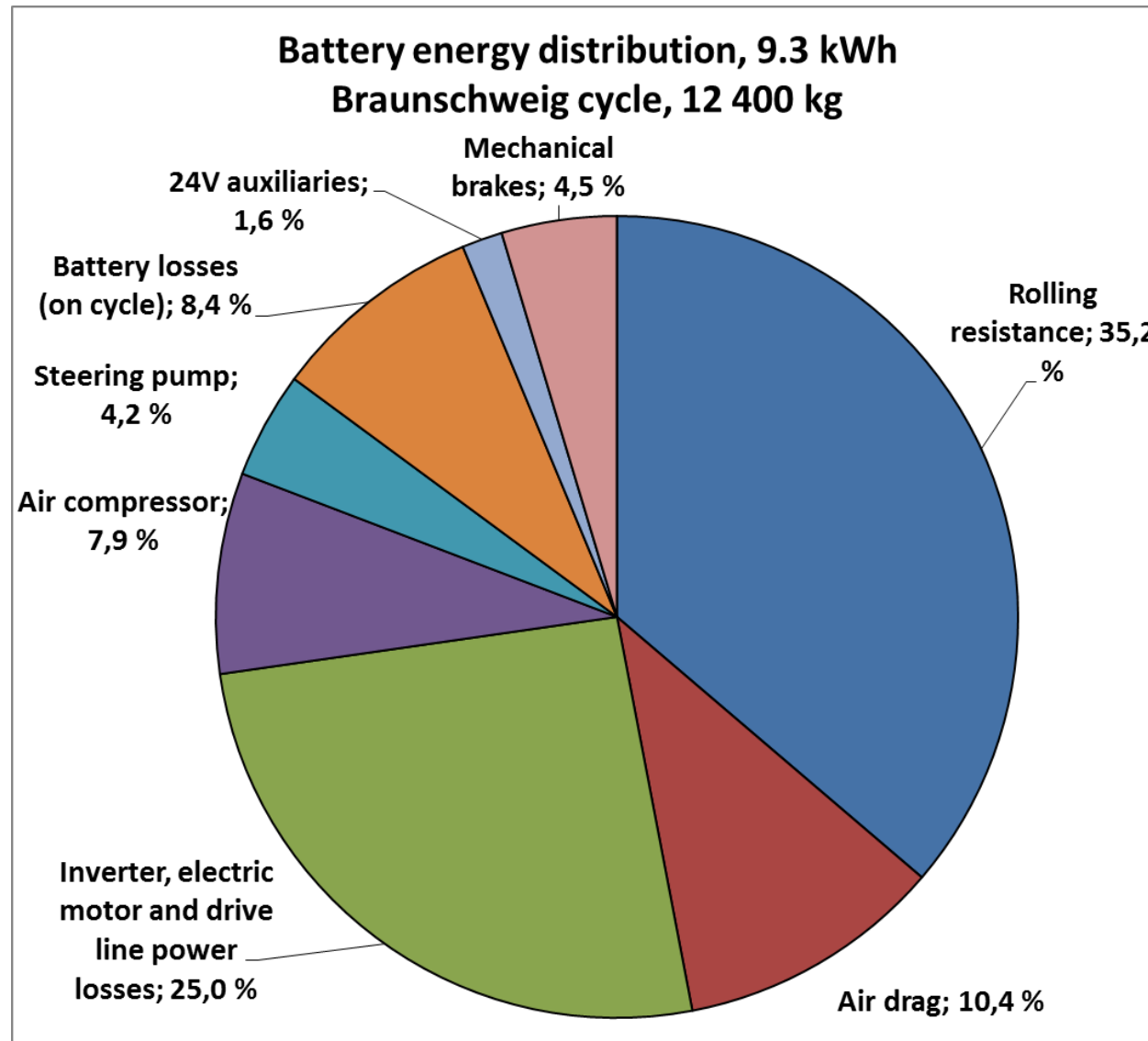


## Pre-results from laboratory tests (new methods)

### Battery energy kWh/km



## Pre-results from laboratory tests (new methods)



## City bus test mule

- There's a need to test individual components or partial systems on neutral test environment → need for prototype test chassis – the test mule
- City bus is typical application for heavy duty electric components and offers enough space for prototype structures → building of city bus based test mule
  - Converting a city bus to electric drive using mainly Finnish component
  - Possible components to test: Batteries, capacitors, electric motors, transmissions, power electronics, vehicle logics, fuel cells, etc.

In the best scenarios, test mule could lead to complete new electric drive line entering to the markets.

**→ Or maybe complete electric city bus based on Finnish technologies?  
Investigation under the way.**

## Next steps

- eBus research topics for 2014
  - Real life performance of commercial electric buses
  - Establishing the reference database for buses and components
  - Effect of climate conditions & practical experiences
  - Effect on driving habits and attitudes
  - Thermal management and range extenders of electric buses
  - Fast charging (related to eBus systems)
  
- Stronger relationship to companies
  - Group of company projects and corresponding additional research extension under development

## Summary

- Four test platforms
- Chassis dynamometer updated for measuring electric vehicles
  - Power source and measurement systems
- Test mule for component testing (not ready for winter testing yet)
- Electric bus test line for benchmarking vehicles and their subsystems in harsh conditions
- Verified simulation tools
- Late 2013 there should be 3 different electric buses on test line + test mule (target 4-6 city buses)
- The reference database and practical experiences are still missing due to delay on the start of the actual electric bus daily operation
- In next two years eBUS will complete the test platform and help companies to enter the growing electric bus markets



**VTT luo teknologiasta liiketoimintaa**