



Options for full electric operation of urban bus lines

- **EBSF Study** - *(state 28 March 2012)*

SUMMARY:

The aim of this study was to identify and compare promising options for implementing an all-electric, largely catenary-free operation of urban buses and to develop recommendations for possible showcase projects based on technical, operational and cost-related aspects.

The report analyzes options for changing batteries, for fast charging of batteries and quick charge of high-performance capacitors (ultracapacitors).

No one system could be identified providing best starting points for all situations. On the contrary, the respective line patterns called for operation-specific recommendations:

In the case of diametrical lines with large distances between the termini the (preferably automatic) battery trailer swap represents the most target-oriented system. Also an upgrade of existing hybrid buses to full-electric buses could be realized with battery trailers. In addition, the battery trailer could also be designed to carry simultaneously passengers and thus to improve the specific energy consumption. The term "trailer" does not necessarily refer to the conventional design, but could also be understood as a kind of power pack with an own axis. This approach also supports the goal-oriented modularization of the transport system bus. For ring lines the quick charging of batteries on partial overhead lines is recommended. Alternatively partial overhead line could be reduced and replaced by docking stations. The other examined variants for full-electric operation show clear disadvantages in comparison to the abovementioned systems.

All systems require, however, a suitable energy and power management to ensure a reliable, efficient and sustainable operation.