



City of
Ljubljana

CIVITAS FORUM 2015

CIVITAS ANNUAL CONFERENCE | 7-9 OCTOBER 2015 | LJUBLJANA



Testing of Five Different Types of Electric Buses

CIVITAS FORUM 2015

8th October 2015

Ljubljana, Slovenia

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The city of Brno

The capital city of the South Moravian region

- Second largest city in the Czech Republic
- 400 thousand inhabitants
- Area: 230 km²

The city of clean electric public transport

- 79.4 km of tram tracks
- 306 trams
- 54 km of trolleybus track (largest trolleybus network in the Czech Republic)
- 145 trolleybuses
- Electric boats on Brno Reservoir
- Transport operator: Brno Public Transport Company, Co. (DPMB)



Electric buses in Brno

Interest in electric innovation

- Analyzing know-how from another cities
- The first electric bus tested in Brno in 2011
 - type SOR EBN 10.5

The CIVITAS 2MOVE2 project

- DPMB joined in 2012
- The measure “Development of electro-mobility and introduction of electric mini-buses“ was accepted
 - The goal was the introduction of 3 electric mini-buses
 - Feasibility study about implementing electromobility was done in January 2014
 - Tests of 4 various electric buses



Why we tested the electric bus?

- To gain new know-how and experience from electric bus operation
- To check the suitability for operation in the specific conditions of the operation
- To measure the electric energy consumption
- To compare the features of electric buses with diesel buses or trolleybuses
- To measure the range per one charge in real operation



Method of testing and assessed features

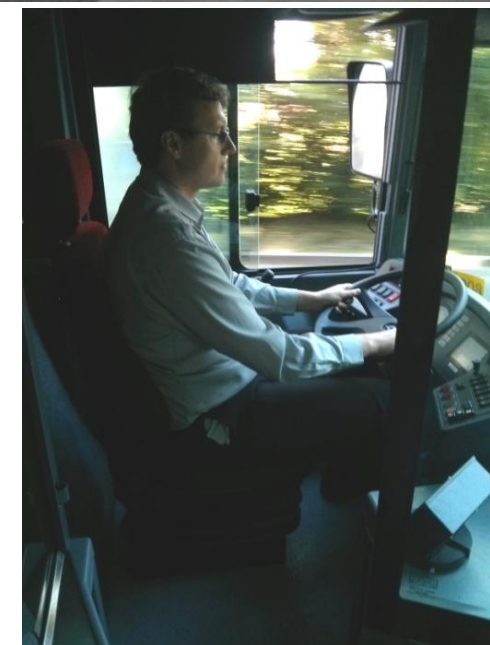
- Length and passenger capacity of the bus
- Electric energy consumption
- Recharging method, recharging speed
- Battery capacity
- Driveability and driver's comfort
- Comparison with trolleybus



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Testing in real operation

- Operated on standard trolleybus and bus lines with passengers
- Driven by experienced and interested drivers



Tested electric buses

SOR EBN 10.5

- Czech manufacturer SOR LIBCHAVY
- Tested in June 2011 (out of The CIVITAS Project)
- Recharged from 3x400 V plug
- Length 10.5 m, capacity: 85 passengers
- Battery capacity: 172 kWh, consumption 0.9 kWh/km, range per charge: 152 km



AMZ CitySmile 10E

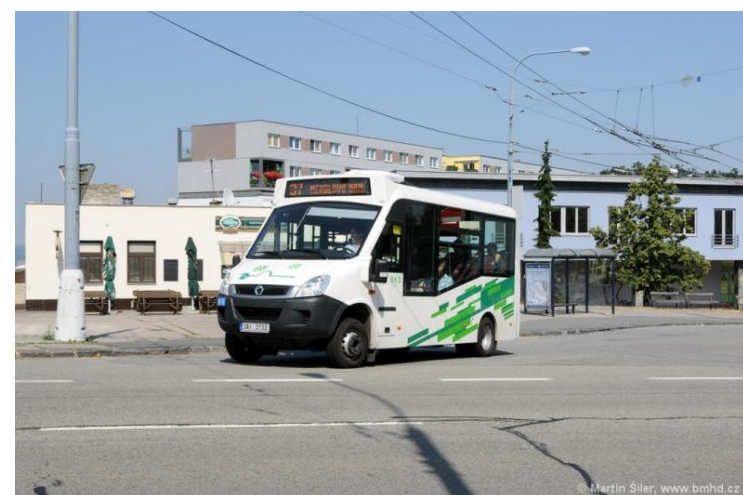
- Polish/Lithuanian manufacturer
- Tested in July 2013
- Recharged by 3x400 V plug
- Length: 10 m, capacity: 85 passengers
- Battery capacity: 230 kWh, consumption: 1.1 kWh/km, range per charge: 170 km



Tested electric buses

Stratos LE 30 E

- Czech manufacturer SKD TRADE
- Tested in august 2013
- Operated on trolleybus lines as extra transport link and on minibus lines
- Recharged by 3x400 V plug
- Length: 6.9 m, capacity 30 passengers
- Electric energy consumption: 0,5 kWh/km, range per charge: 150 km



Siemens/Rampini Alé EL

- Product of Siemens (electric part) and Rampini (chassis)
- Borrowed from Wiener Linien (Vienna Public Transport Company)
- Recharging possible on the track from the existing infrastructure
 - Using pantograph from tram or trolleybus overhead lines during breaks on terminus stations
 - By 3x400 V plug in depot
- Operated on special line “E” during the International Engineering Trade (October 2013)
- Length: 7.7 m, capacity: 46 passengers
- Battery capacity: 96 kWh, range per charge: 60 km





Škoda 26 BB HE PERUN

- Czech manufacturer Škoda Electric using Solaris bus bodywork
- Tested in March 2014 during electro-technical trade “Ampér“
- Operated on trolleybus lines and on the fairground area (shuttle bus)
- Recharging
 - Via 3x400 V plug
 - Using Ultra fast charger on terminus station (not used in Brno)
- Length: 12 m, capacity: 82 passengers
- Battery capacity: 222,2 kWh
- Range per charge: 140 km





Type of the electric bus	Length	Passenger capacity	Range per charge	Average Consumption	Remarks
SOR EBN 10.5	10.5 m	85	152 km	0.9 kWh/km	Electric energy only for driving, diesel heating
AMZ CitySmile 10E	10 m	85	170 km	1.1 kWh/km	Operated without passengers
SKD Stratos LE 30 E	6.9 m	30	150 km	0.5 kWh/km	Electric energy only for driving, diesel heating
Siemens Rampini	7.7 m	46	60 km	1.3 kWh/km	Ongoing recharging (pantograph)
Škoda Perun	12 m	82	140 km	1.3 kWh/km	

Basic technical conditions for tender according to the results of test operation suitable for Brno

- Recharging on terminus stations from overhead lines – suitable for Brno
- Suitable length: 7,5 – 10,5 m
- Electric heating, electric air-condition
- Gradeability at least 15 %
- Electric brake with recuperation
- Capacity at least 40 passengers



Tendering process

- Opened March 2015, closed June 2015
- No offers were submitted - likely reasons:
 - short period between the sign of the contract and the first delivery
 - Low number of electric buses in the contract
- DPMB is still interested in electric buses and searches for new opportunities to introduce new zero emission buses into operation





Thank you!

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