



Deployment IMC trolleybuses and innovative battery storage solutions in Pilsen

Jiri Kohout, PMDP

Final trolley 2.0 conference

12-13 November 2020



CONTENT

- Pilsen on the route to zero-emission transport
- Buffer storage station - EfficienCE
- Big test of IMC trolleybuses



Pilsen on the route to zero-emission transport

using In-Motion Charging concept

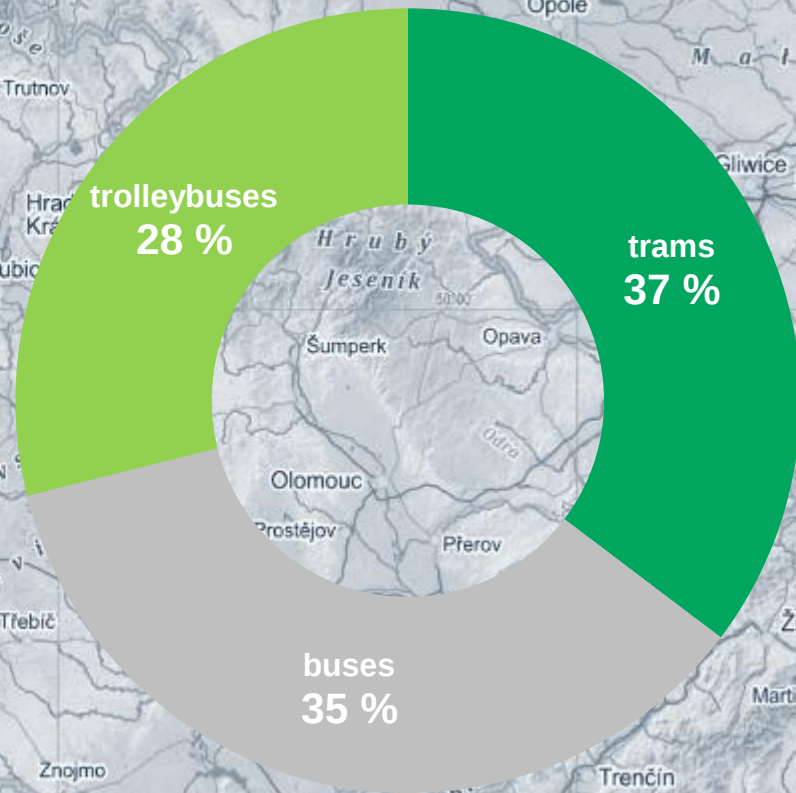
**65 % of Pilsner city public transport
is already electric!**

Město Plzeň

Plzeň

Annual performance (2019)

Trams	5,7 mil. km
Trolleybuses	4,4 mil. km
Buses	5,4 mil. km



PILSNER SMART CITY GOAL



“To increase the share of electric traction in Pilsner PT to 85 % in 2030”

COMPLETED TASKS & PLANS FOR THE NEAR FUTURE

✓ **done:** new trolleybus and bus depot



➤ COMPLETED TASKS & PLANS FOR THE NEAR FUTURE

- ✓ **done:** new trolleybus and bus depot
- ✓ **done:** ongoing investment in rolling stock

since 2017...

24 new standard length battery equipped IMC trolleybuses

8 new articulated battery equipped IMC trolleybuses

14 new trams



➤ COMPLETED TASKS & PLANS FOR THE NEAR FUTURE

- ✓ **done:** new trolleybus and bus depot
- ✓ **done:** ongoing investment in rolling stock
- ✓ **done:** **overhead infrastructure modernization**





COMPLETED TASKS & PLANS FOR THE NEAR FUTURE

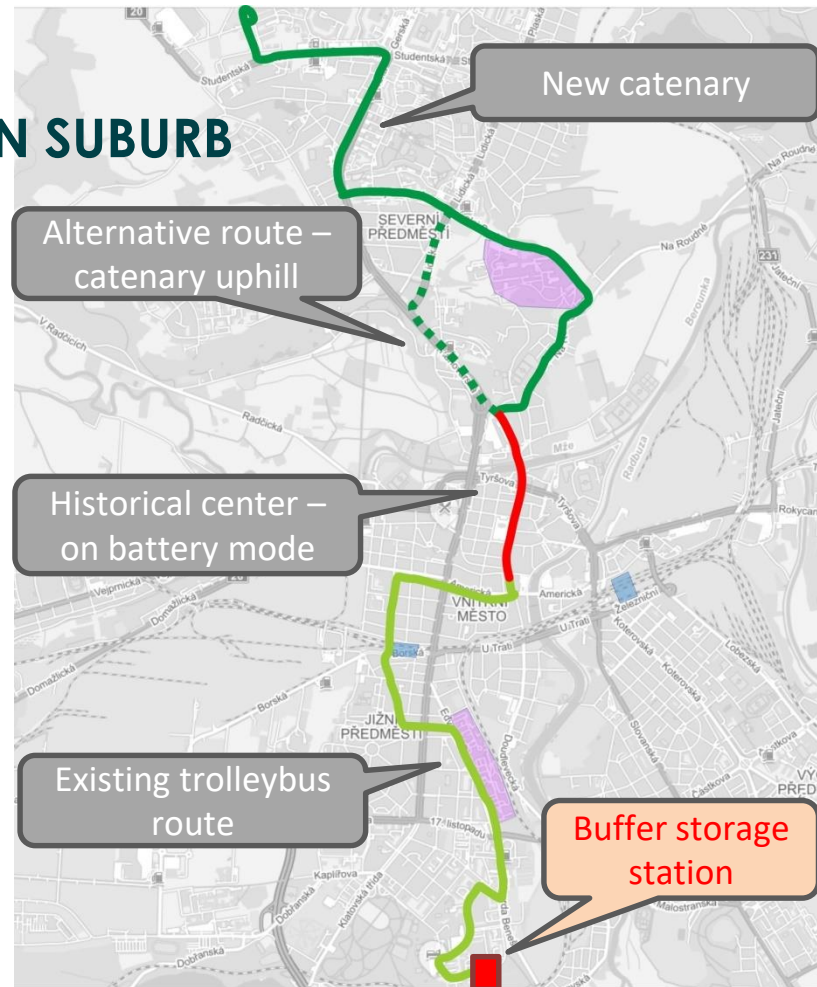
- ✓ **done:** new trolleybus and bus depot
- ✓ **done:** ongoing investment in rolling stock
- ✓ **done:** overhead infrastructure modernization
- ✓ **done:** Sustainable urban mobility plan for Plzeň 2025
- ✓ **done:** tram extension to university (2019)

Next steps to 2025:

- **purchase of 25 new IMC trolleybuses**
- **complete reconstruction of the tram depot (65 mil. EUR!)**
- **get zoning and building permit & start of implementation of the trolleybus project to Northern Suburb**
- ...

TROLLEYBUS PROJECT TO THE HOSPITAL AND NORTHERN SUBURB

- Extension length 6,7 km
- Height difference 108 m
- Peak/off-peak frequency 15/10 min
- +9 new articulated IMC trolleybuses





Buffer storage station

Project EfficienCE



➤ BRING INNOVATION TO PUBLIC TRANSPORT

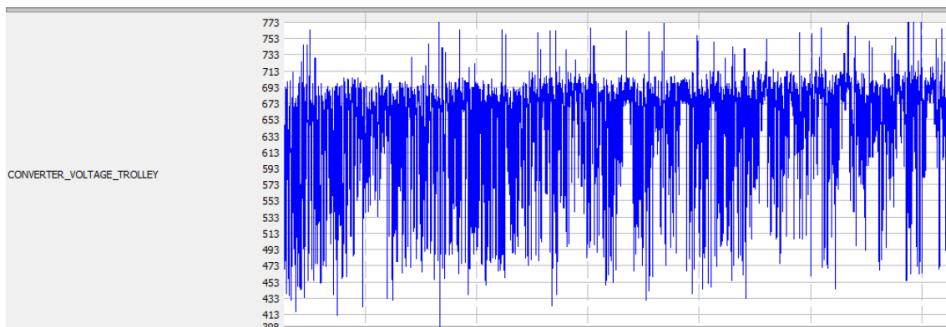
Buffer storage station will

- make the trolleybus power network smart and more stable
- help equalize the electric power demands and voltage level



➤ GETTING NEW EXPERIENCE

Launch event
2nd Oct 2020





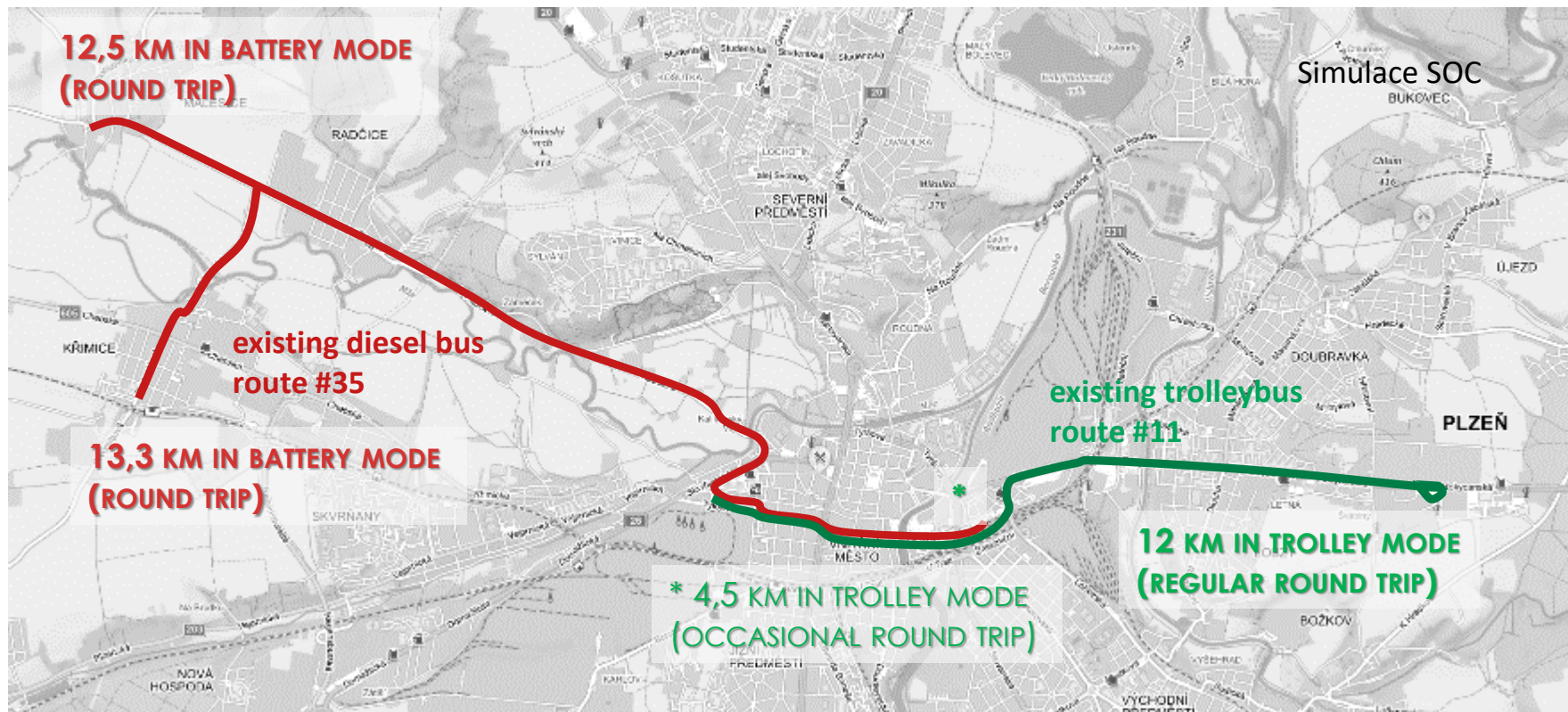
Big test of IMC trolleybuses

on special new testing route #19 in Pilsen



➤ TRIAL IMC ROUTE #19

Following a planned extension of trolleybus route #11



TRIAL OPERATION

A total of 23 IMC battery trolleybuses of 4 different types took turns on the testing route #19.

In operation on working days
from 2 Dec 2019 to 26 Jun 2020



ROUTE PARAMETERS

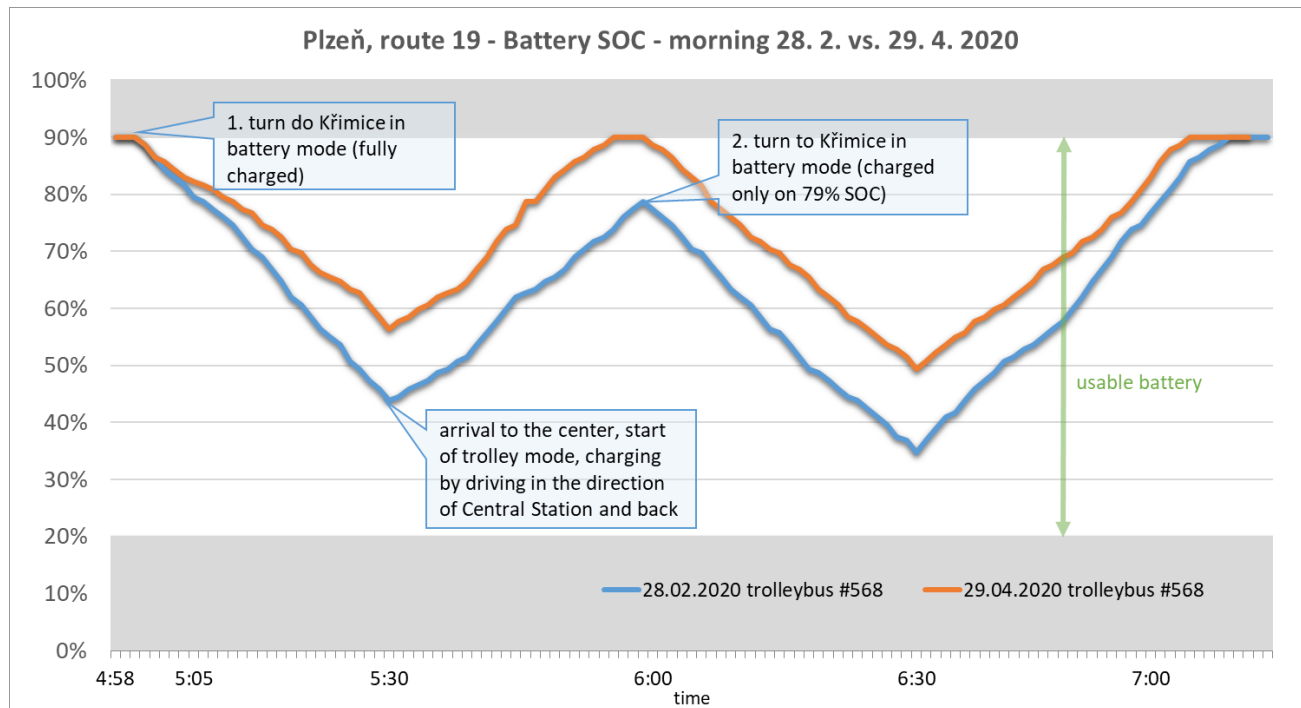
Daily mileage: 230 km ... of which 131 km in battery mode

Trolley : Battery ratio

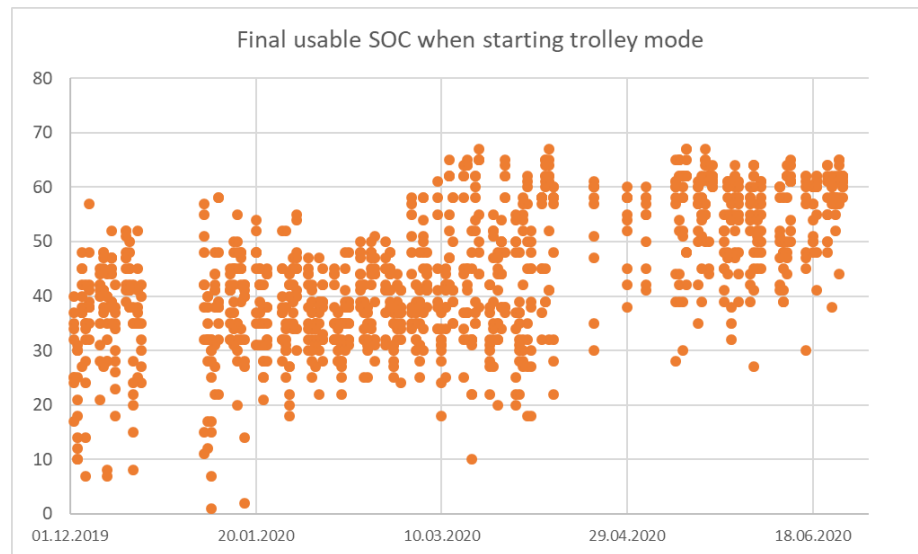
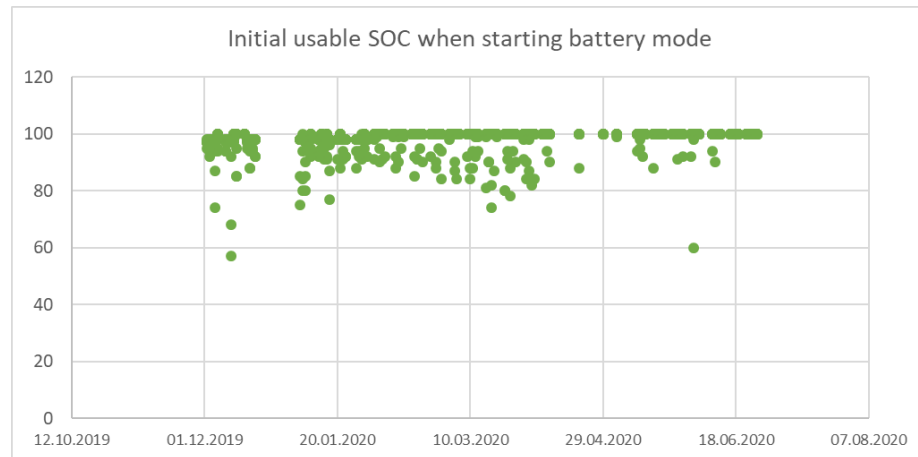
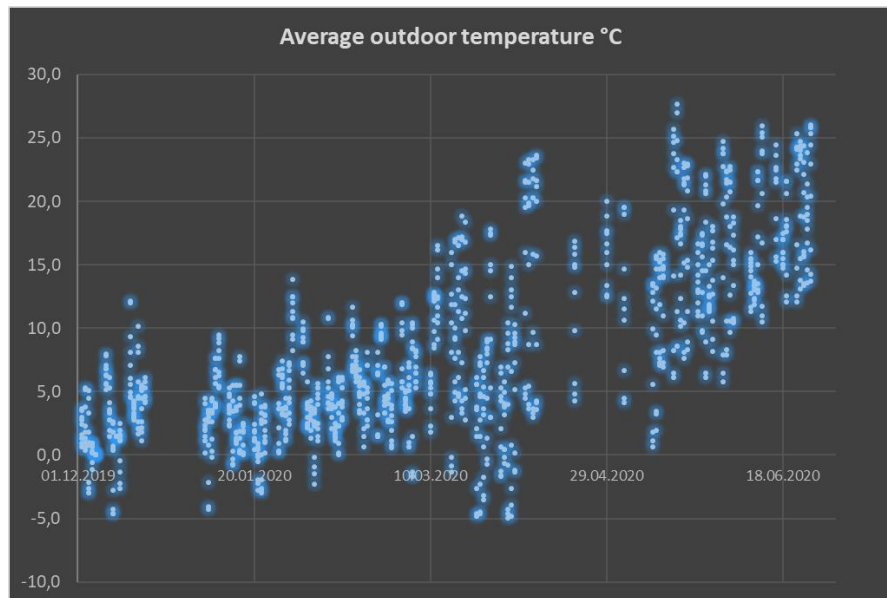
mode	trolley	battery	
since 2.12. 2019	41%	59%	km
	64%	36%	h
since 20.1. 2020	43%	57%	km
	66%	34%	h

Recommended minimum time to trolley : battery ratio is 2 : 1

SOME RESULTS

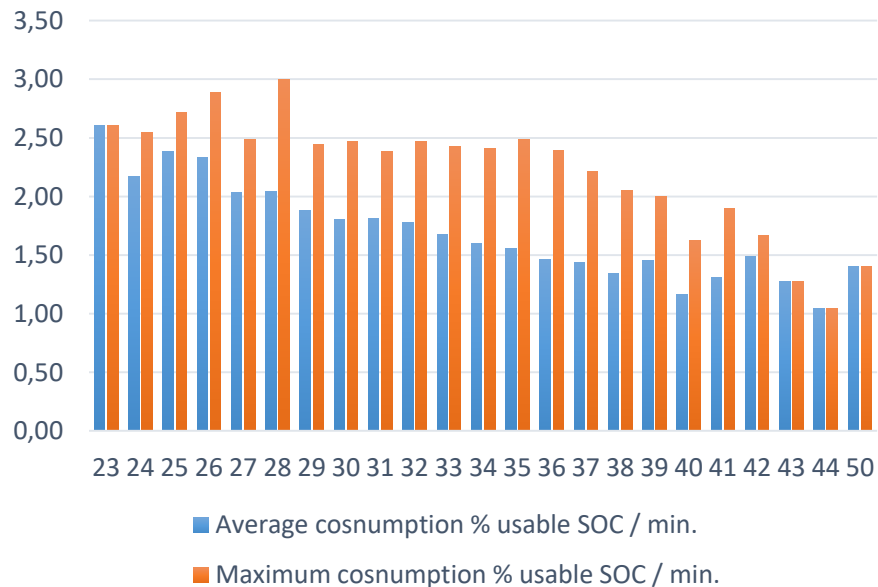


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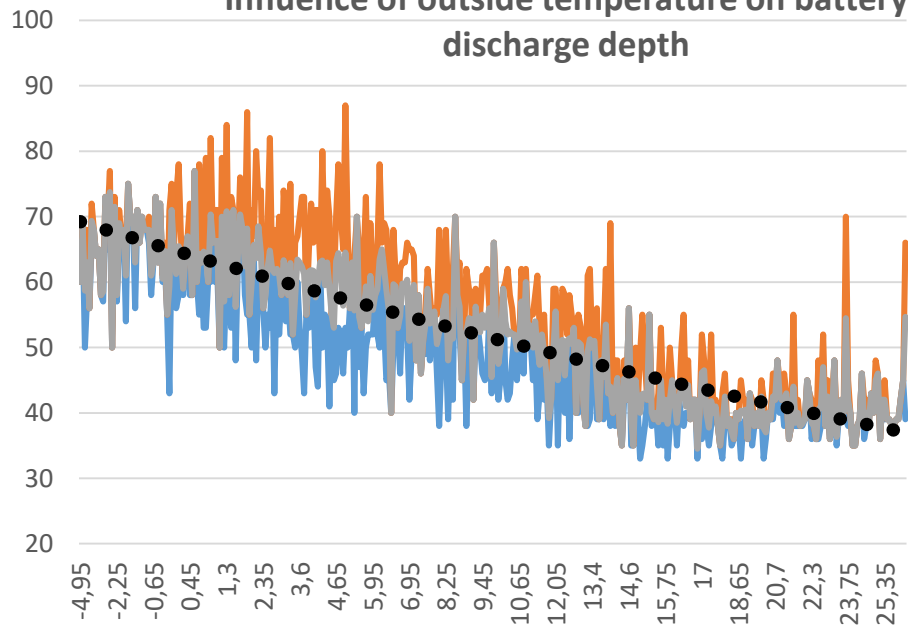


> SOME RESULTS

Average consumption % SOC depending on time in battery mode



Influence of outside temperature on battery discharge depth



NEW IDEA FOR BUFFER STORAGE STATION

Use of the battery station at terminus Křimice



Supplied only to low voltage
energy grid 3 x 400 V 25 A

Short-term static charging of trolleybuses when standing
for 4 min. up to 9.5% usable SOC

+ Charging stands for personal electric cars

CONCLUSION

IMC is about flexibility and efficiency!

- charging while standing as well as moving
- lighter battery & longer lifetime
- using and extending existing infrastructure
 - synergy with tram network





QUESTIONS?

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