



Silesian
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9th International Conference on Sustainable Solid Waste
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Investigating electric garbage trucks use for waste collection in urban and rural communities

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A purpose of this study

This study focuses on the novel electric vehicles that can be used for waste collections in urban and rural communities.

The key points we explore are:

- Availability of electric garbage trucks
- Possibility of replacement of the currently used vehicles
- Operational conditions
- Investment and operational costs
- Environmental and social benefits
- Disadvantages and weaknesses



Availability of electric garbage trucks

Electric garbage trucks are becoming a new category of vehicles offered by manufacturers of heavy trucks and light commercial vehicles for the collection of various categories of waste:

- Heavy duty garbage trucks – fully electric
- Electric drive system that replaces the conventional auxiliary drive of a truck. The vehicle itself is driven by a diesel engine but chassis has electric motor
- Light commercial vehicles – Vans – numerous producers already offering broad range of these vehicles



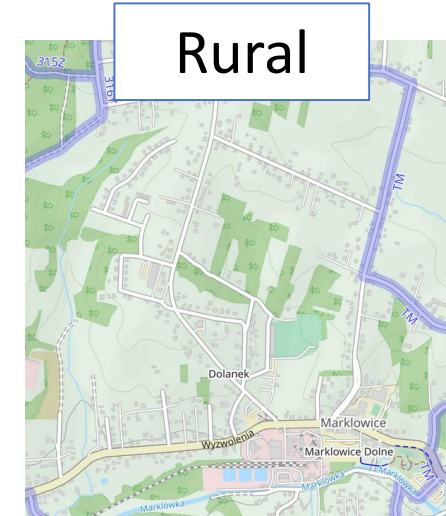
Replacement of the currently used vehicles - is it necessary and possible?

- Environmental issues - replacing older diesel vehicles with all-electric versions would be very helpful in reducing air pollution.
- Possibility of the delivery of the vehicles – from ordering to delivery;
- Existing infrastructure – charging stations, service points and for vehicle maintenance;
- Seasons of the year – influence on the humidity and temperature on the operation of a vehicle;
- Costs – purchase, use, service, end-of-life (recycling);



Operational conditions

- Various categories of waste
- Various vehicles required for the collections
- Various types of urban development and settings

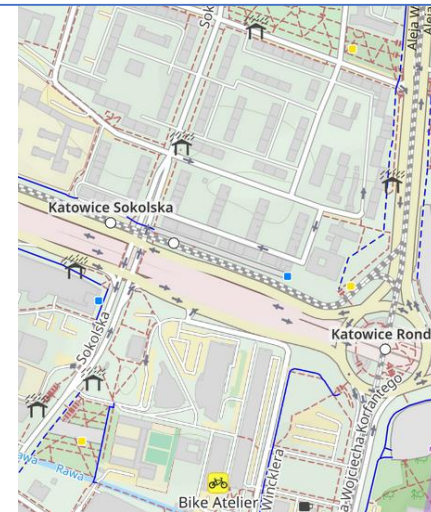


Garbage truck

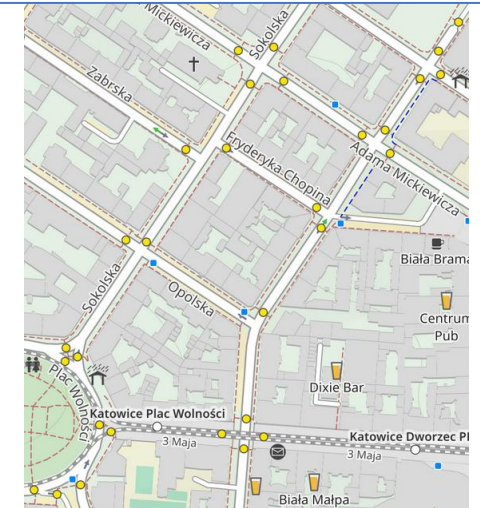


Light commercial vehicles

Urban – blocks of flats



Urban – city center



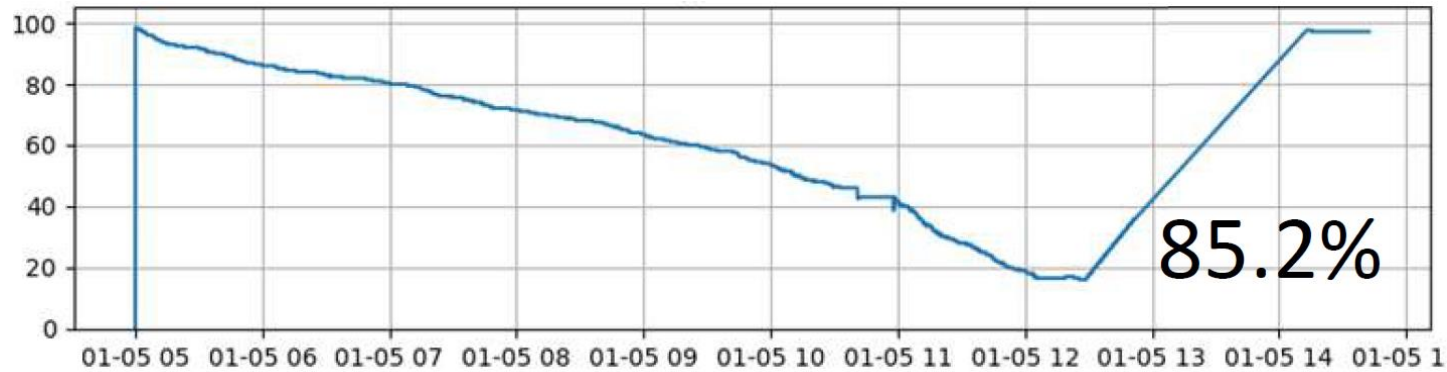
Technical parameters of an electric garbage truck

Volvo FE Electric	Main parameters
Number of axes	3
Maximal power [peak/continuous]	400 kW/330 kW
Number of batteries	4
Batteries capacity	265 kWh
Energy recuperation unit	70 kW, 270 Nm
Charging time [quick-charge, standard]	1.5 h/ 11.5h
Nominal distance	120 km

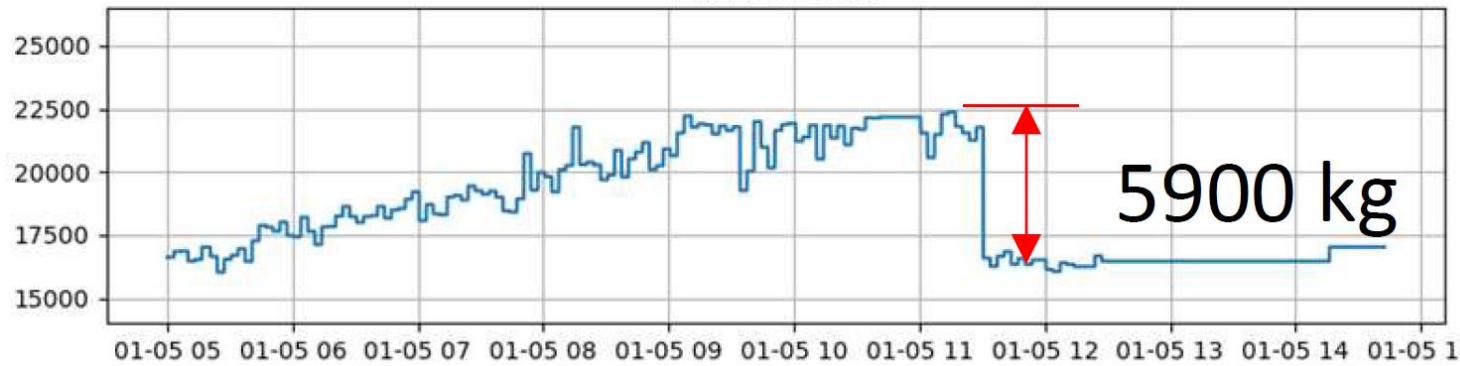


Operational parameters – large city

[%] – battery charge

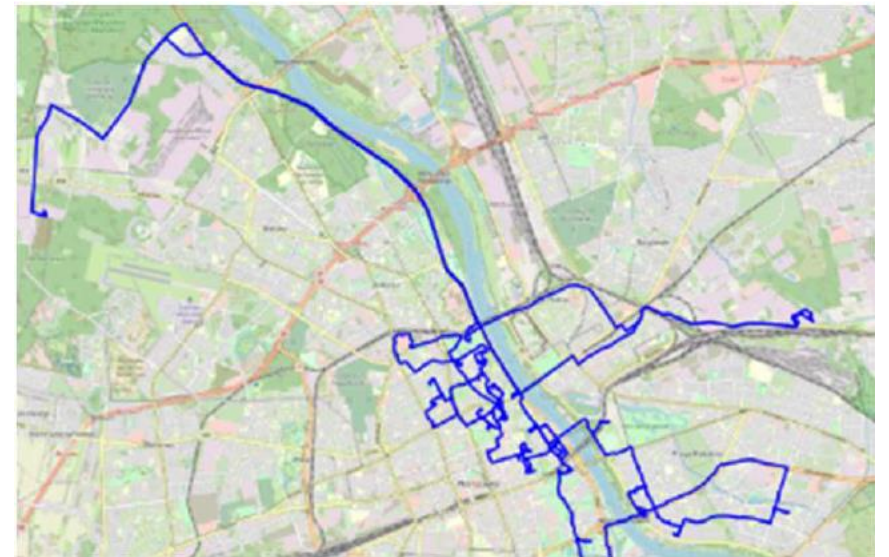


[kg] – mass of the collected waste] day, hour



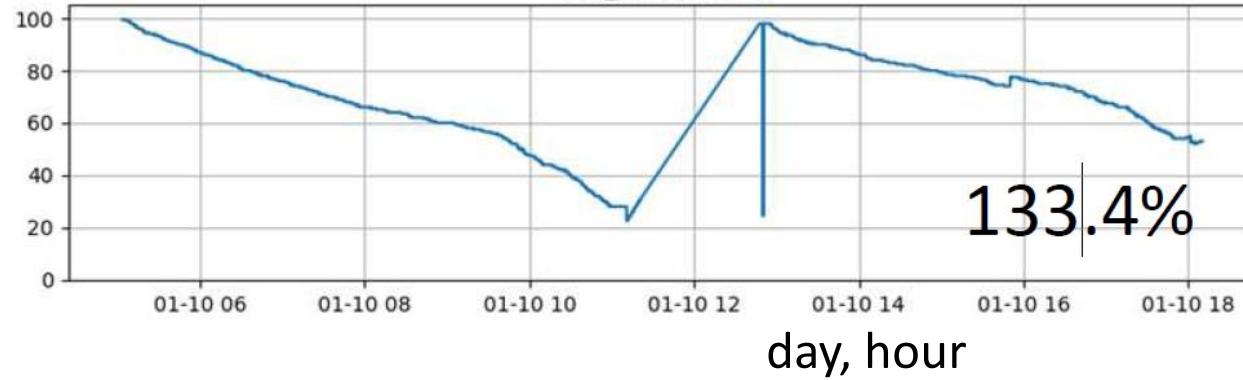
day, hour

Trace of the routing

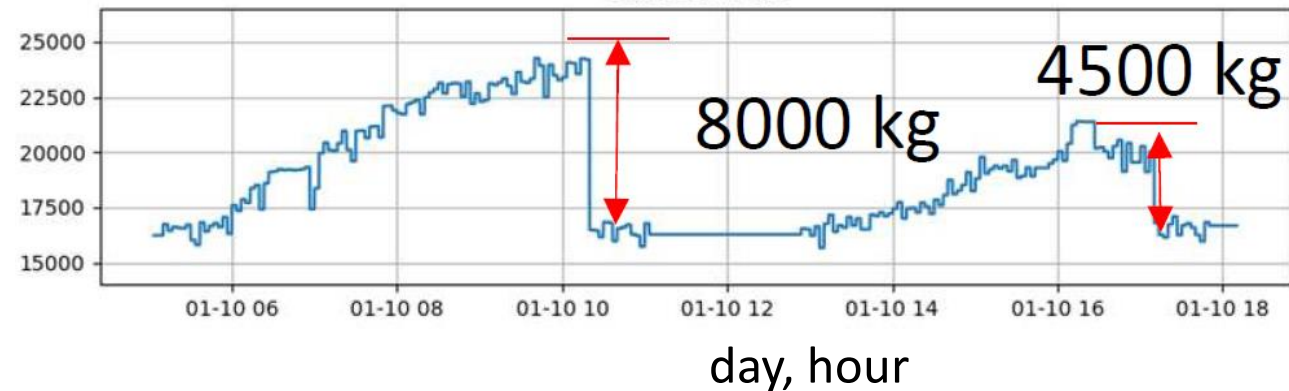


Operational parameters – large city (more stops)

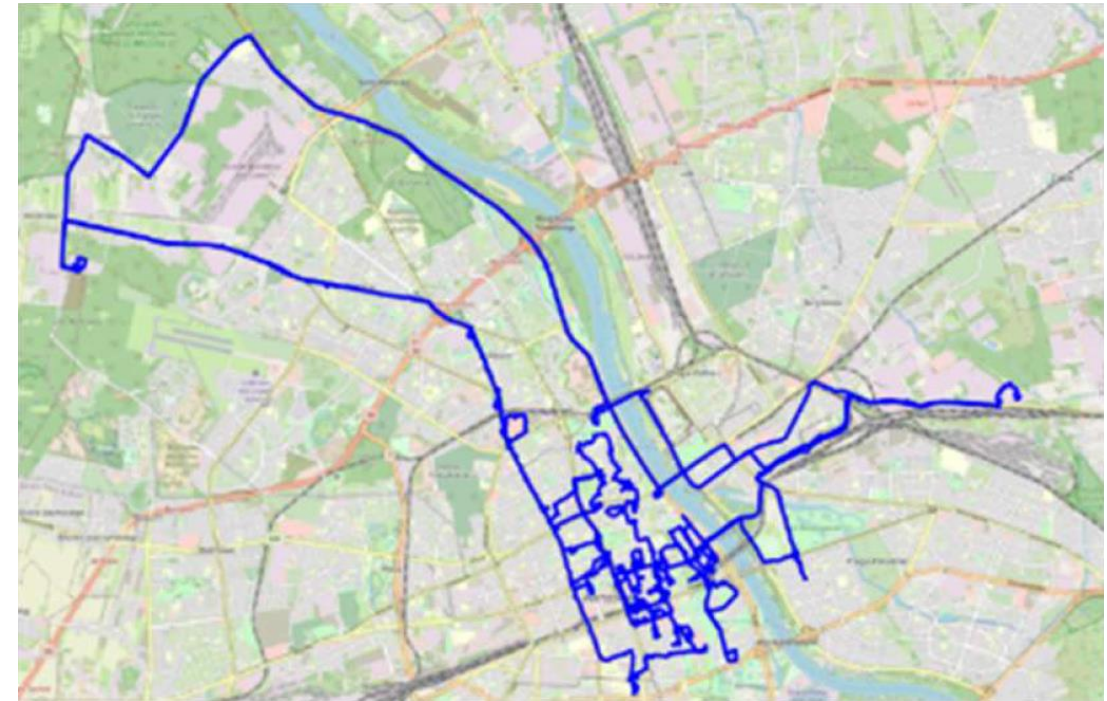
[%] – battery charge



[kg] – mass of the collected waste



Trace of the routing



Investment and operational costs of garbage trucks

	Diesel powered garbage truck	Electric garbage truck
Purchase of a new vehicle	170.000 EUR	400.000 EUR
Leasing (5 years) payment per year	44.000 EUR	105.000 EUR
Operational cost per year	6500 EUR	8700 EUR
Parts and service	6300 EUR	? – unknown *
Energy/fuel cost (average)	67 EUR	40 EUR
Waste collection – per day		

*** Unknown costs of parts and frequency replacement for Electric garbage truck**

Environmental and social benefits

- Decreased pollution, especially in densely populated areas – city centers
- Decreased noise during waste collections
- Possibility of energy recuperation
- Creation of environmentally friendly – zero emission waste collections



Disadvantages and weaknesses of electric garbage trucks

- More expensive than diesel powered vehicles
- High cost of batteries replacement
- Unknown durability of components (spare parts)
- Necessity to invest in charging stations
- Long time of charging batteries (comparing to filling the tank)
- Much higher risk of dangerous fire in case of accident
- Variations of distance depending on humidity and temperature
- Uncertainty of return to a company's base in case of low battery level and traffic



Conclusions



- Waste collections can be supported by modern electric garbage trucks.
- **Several manufacturers offer vehicles – fully electric or electric split bin lift**
- Decision of purchase of the electric garbage trucks must be supported by multi-criteria analysis taking into consideration pros and cons of costs, environmental and social benefits and potential risks
- **Tests conducted in municipalities in Poland indicated flexibility of operation and driving on a one battery charging per one shift**
- Recouperation of electric energy is one of the greatest achievements in efficient operation
- **The residents especially in densely populated communities would benefit zero-emission waste collections and decreased noise during a garbage truck movement and lifting the container**
- Detailed tests in variable climates conditions are necessary for evaluation of the electric garbage trucks by the collection companies.

Thank you for your attention

Σας ευχαριστώ για την προσοχή σας





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