Efficiency of electric public transport compared to a bus

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International Association of Urban Electric Transport Enterprises

Our members:

- Tramway and trolleybus enterprises in Russia and CIS;
- Manufacturers of rolling stock, spare parts and components from Russia, CIS and Europe;

Our goal: promote active development of electric public transport in cities by means of:

- Quality standards for public transportation, promoting the advantages of electric transport: low emissions; low running costs, low accident rate, high reliability;
- Updating of legislation and regulations;
- Promotion of government grants for development of tramway and trolleybus systems

Public transport system governance cycle

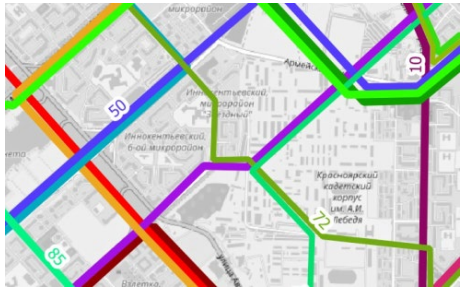
ерства транспорта Российской
і 2017 г. № НА-19-р «Об
ого стандарта транспортного
ия при осуществлении перево
втомобильным транспортом и
лектрическим транспортом»

Quality standard

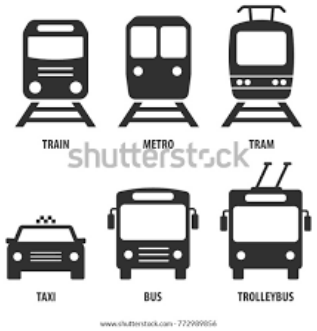
Subsidies

Revenue / Fares

Actualization
2-3 times / year



Route parameters



Instrument choice

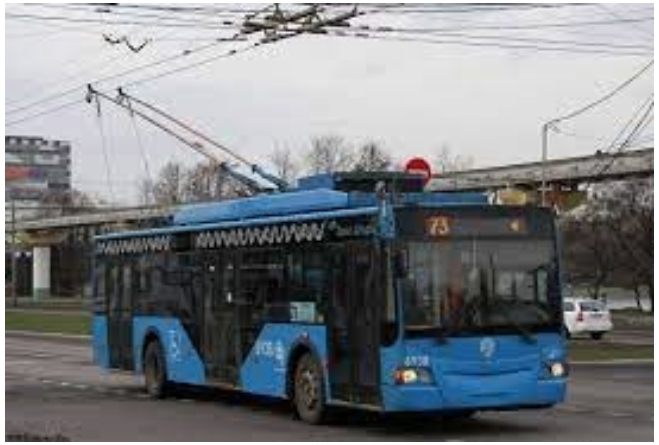
Costs

Electric bus (charging at terminals) VS trolleybus (in-motion charging)

Comparison of a typical 10-km route with 5 minutes headway:

№	Parameter	Tb	El-bus	El / Tb
1	2	3	4	5
1	Turnaround trip length, km	20,0	20,0	100%
2	Speed, km/h	18,0	18,0	100%
3	Turnaround trip time, min	66,7	66,7	100%
4	Time buffer 10%, min	73,3	73,3	100%
6	Headway	5,0	5,0	100%
7	Ceiling time to headway	1,7	1,7	100%
5	Required charging time (2x10 min), min	0,0	20,0	
8	Rest of charging time above ceiling time	0,0	18,3	
9	Total turnaround trip time ceiled to headway, min	75,0	95,0	127%
10	Vehicles in motion	15,0	19,0	127%
11	Vehicles total (technical availability = 85%)	17,6	22,4	127%
12	Vehicle price	22,0	34,4	156%
13	Battery replacement price for life cycle (15 years)	0,0	10,3	
14	Total vehicle capital costs in life cycle (vehicle + batteries)	22,0	44,7	203%
15	Annual expenditure for the rolling stock	25,9	66,6	257%

Opportunity charging at terminals



In-motion charging by contact wires

2 minutes of diesel bus fuelling = 200 minutes of electric bus charging

Even when battery price is ~zero, costs on

Expenditure comparison (Trolleybus vs terminal charging electric buses)

Total costs of a typical 10-km route with 5 minutes headway running, mln. rubbles:

№	Expentidures per year	Trolleybus		Electric bus (charge at terminals)		El - Tb	El / Tb
1	2	3	4	5	6	7	8
1	Vehicles capital costs	25,9	16,9%	66,6	31,9%	40,8	2,57
2	Driver time prices	29,0	19,0%	35,0	16,8%	6,0	1,21
3	Electricity	17,0	11,1%	15,0	7,2%	-2,0	0,88
4	Vehicle repairs	28,0	18,3%	28,0	13,4%	0,0	1,00
5	Contact wire and substations	34,0	22,2%	41,0	19,7%	7,0	1,21
6	Depo expenditures	19,0	12,4%	23,0	11,0%	4,0	1,21
7	TOTAL	152,9	100,0%	209	100,0%	55,8	1,36

With the current battery price, a typical route running would cost 36% more with electric buses on opportunity charging then trolleybus (in-motion charging)

Electric bus (charging at terminals) VS trolleybus (in-motion charging)

Typical transit modes cost comparison for a large city (1-mln inhabitants):

№	Transit mode	Running costs per year, mln.RUR	Operational kilometers per year, thousand km	Price per running km, RUR/km	Amount of passenger-km-seats in a year, pass-seat-km	Costs per pass-km, RUR/pass-seat/km	Amount of passengers, mln/year	Cost for one passenger, RUR
1	2	3	4	5	6	7	8	9
1	Tramway	1 494,42	7 438,96	200,89	1 017,17	1,47	233,86	6,39
2	Trolleybus	2 207,98	13 547,07	162,99	1 300,52	1,70	165,07	13,38
4	Diesel bus	9 016,85	58 260,39	154,77	3 848,52	2,34	103,88	86,80
5	S-Bahn	1 295,95	3 908,36	331,58	1 429,75	0,91	72,93	17,77
7	**Total**	14 015,19	83 154,78	168,54	7 595,95	1,85	341,88	40,99

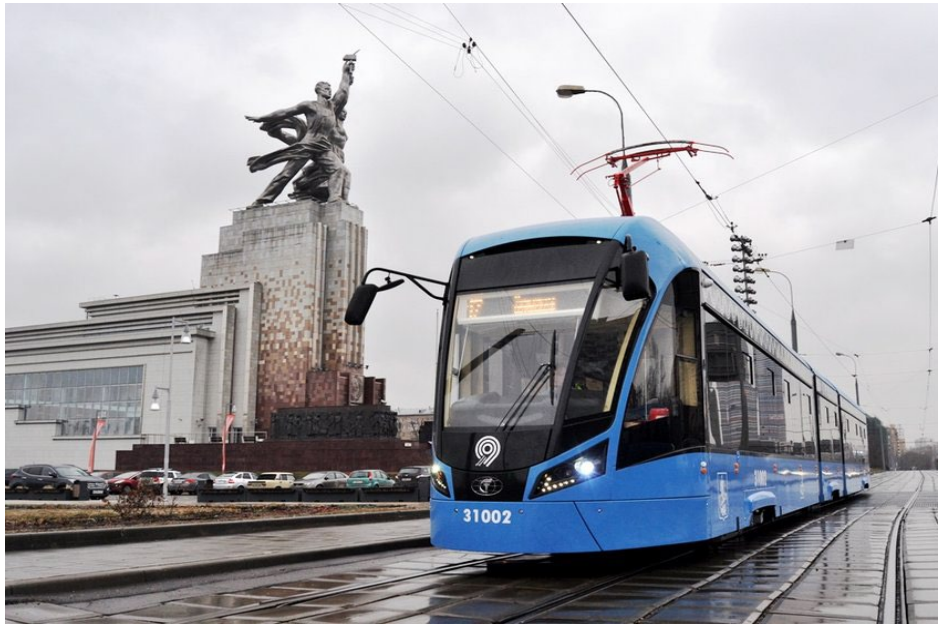
We should pay more attention to rehabilitation and development of traditional electric transport modes (tramway and trolleybus).

Thank you for your attention

What are your challenges and answers?

How to make public transport high-quality and stable?

How to recover underfinanced systems?



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