Researcher Links UK-Russia Workshop

Scientific and Technical Grounds of Future Low-Carbon Propulsion

19th - 22nd November 2018, Northumbria University at Newcastle, UK

Process modeling of battery discharge

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Northumbria University NEWCASTLE

NAMI

Newcastle University

University of Sunderland

BRITISH COUNCIL

NNSTU – federal flagship university. The best regional technical university

Nizhny Novgorod State Technical University is one of the leading in Russia which has a status of Federal flagship university.

NNSTU

More than **25000** students

More than **1000** professors and teaching staff

7 educational-scientific institutes

More than **20** scientific centers and laboratories

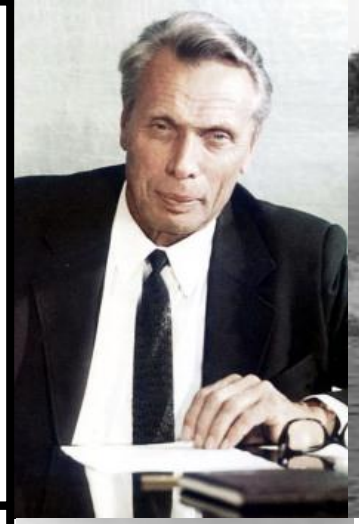
Transportation Systems Institute

NNSTU

ИТС

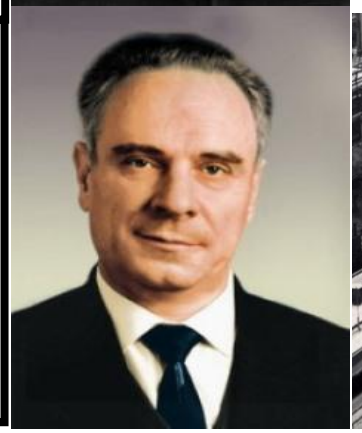
27 Doctors of Science and
107 Candidates of Sciences (PhDs)

Rostislav Evgenievich Alekseev - the maker of hydrofoil craft and ekranoplans (Soviet ground-effect vehicles such as flarecraft);



Arkady Fedorovich Nikolaev - distinguished inventor of automotive vehicles and Antarctic explorer;

Igor Ivanovich Afrikantov - creator of ship nuclear power plants.



GAZ – key partner of NNSTU in the field of automotive industry

GAZ regional departments (production of commercial vehicles)

Ltd. «United engineering center» - R&D and prototyping **Ltd. «Automobile plant GAZ»** - light and medium commercial vehicles

Ltd. «Pavlovo bus plant» - buses of medium class

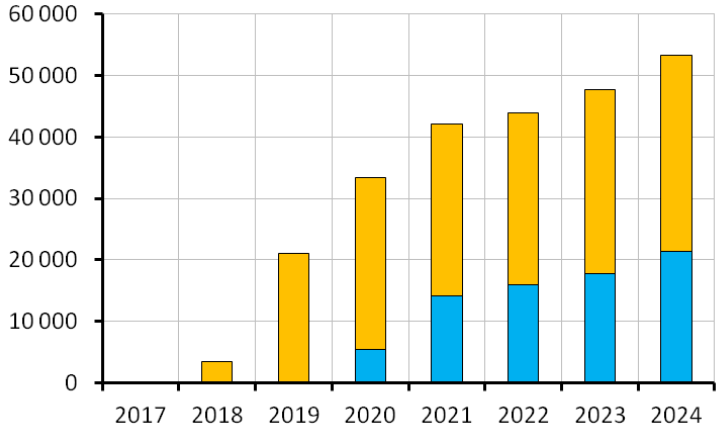
GAZ positions at Russian market

Light commercial vehicles

Medium commercial vehicles

Buses of light and medium classes

NNSTU-GAZ cooperation



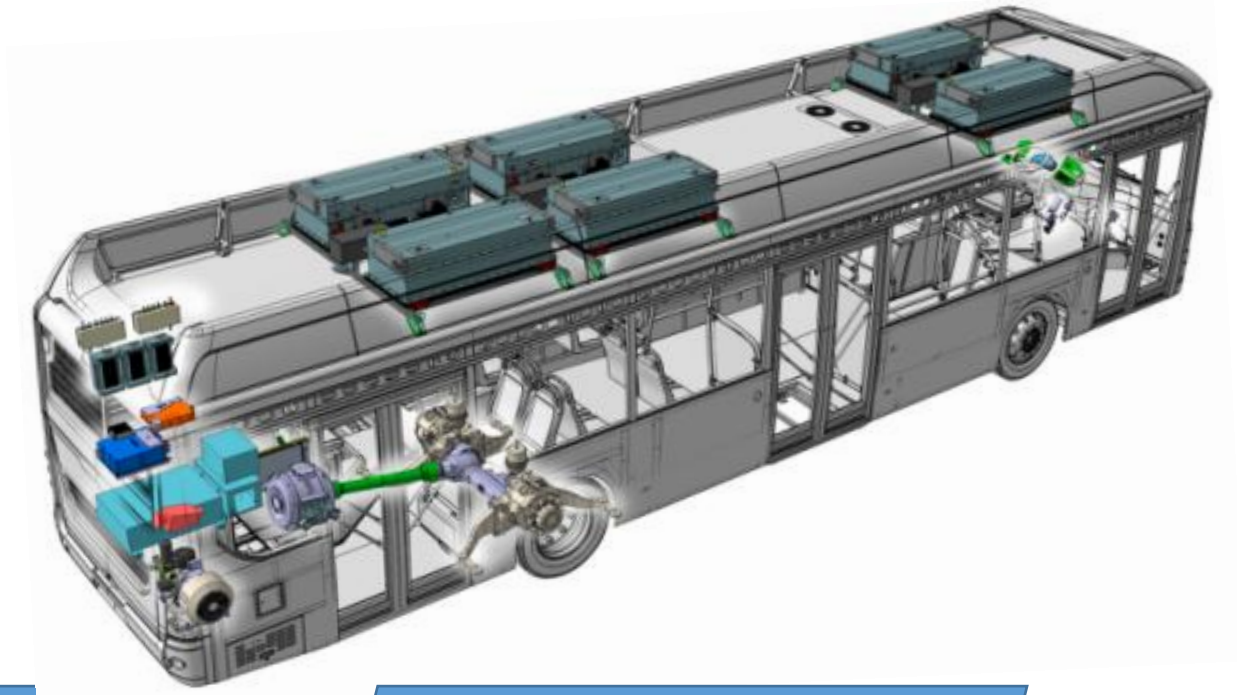
The expected volume of sales of new GAZ vehicles which has innovations developed in cooperation with NNSTU, million rubles

Vehicles with ECS

Vehicles with ADAS

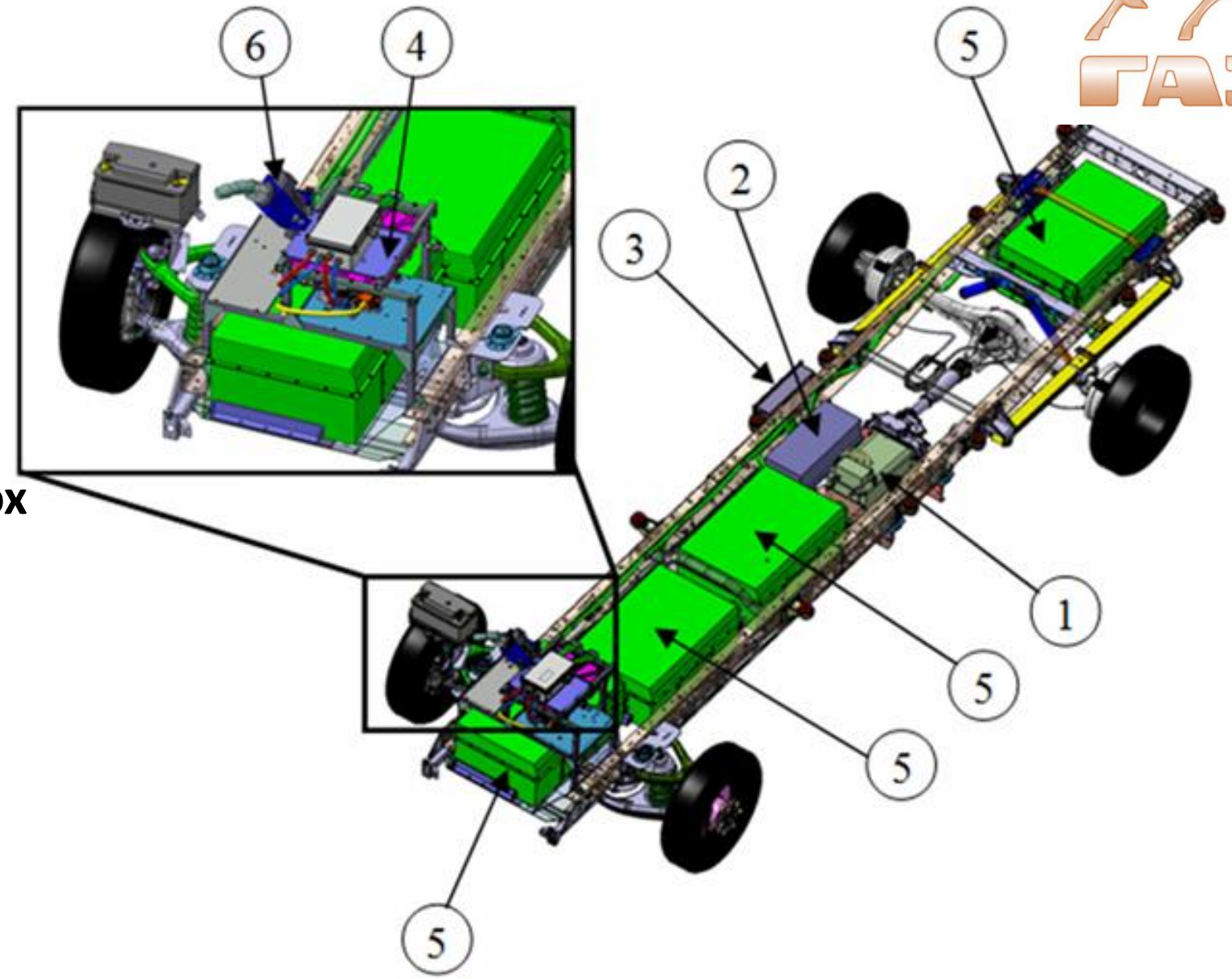
Since 2015 the Group builds electric vehicles

GAZelle NEXT Electro



LiAZ Electro

Electric traction drive design



1. Electric motor end gearbox
2. Controller Electric motor
3. Switching unit
4. Charging unit
5. Li-ion battary
6. Charging port

Electric traction drive design

Движение в городе

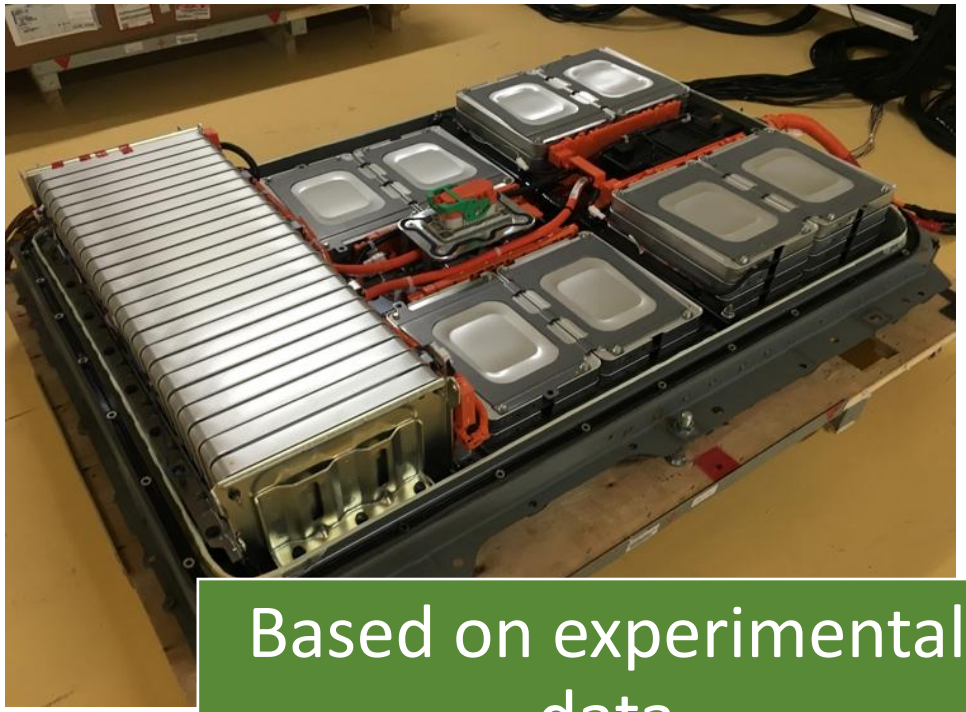
Движение по магистрали

Движение с постоянной скоростью, движение по маршруту

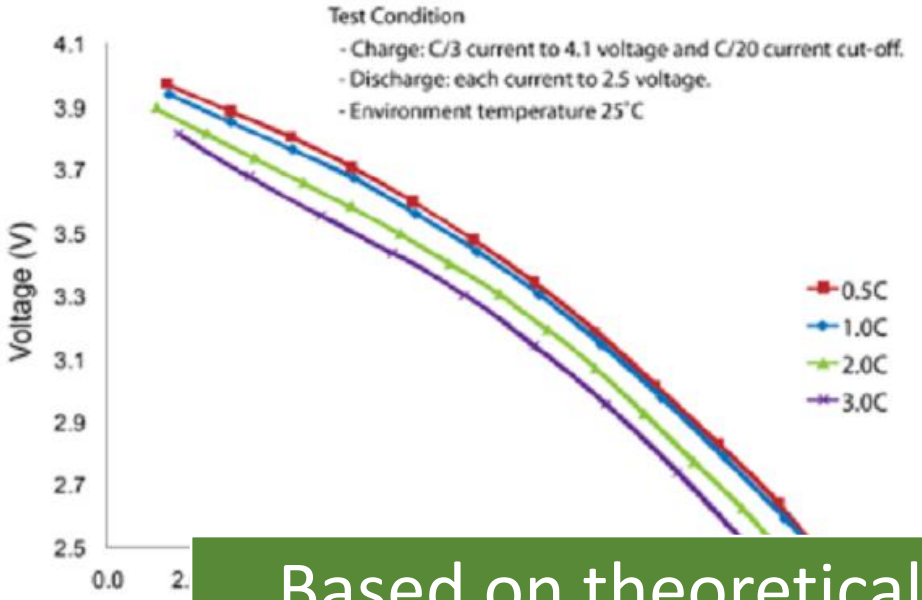
Работа электродвигателя

Разряд батарей

Battery discharge process - representation



Based on experimental data



Based on theoretical data

Ragona's method

The correlation coefficient

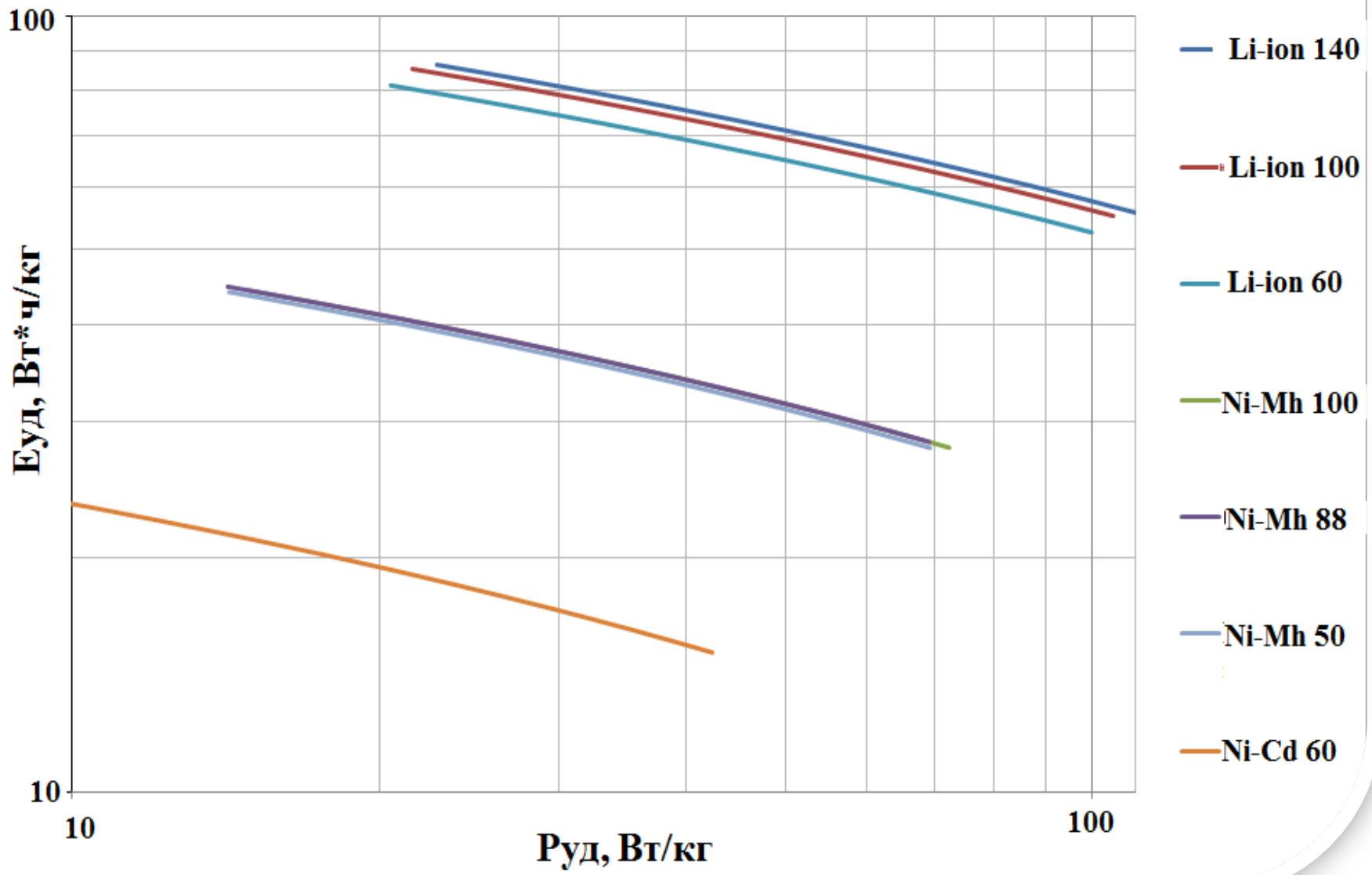
Capacity value	C/0,25	C/0,5	C/1	C/2	C/3	C/3,5	C/4	C/5	C/6	C/7	C/8	C/10
coefficient	0,66	0,83	1,00	1,14	1,23	1,27	1,31	1,36	1,40	1,43	1,45	1,50

The analytical dependencies of the discharge $E_{уд} = f(P_{уд})$

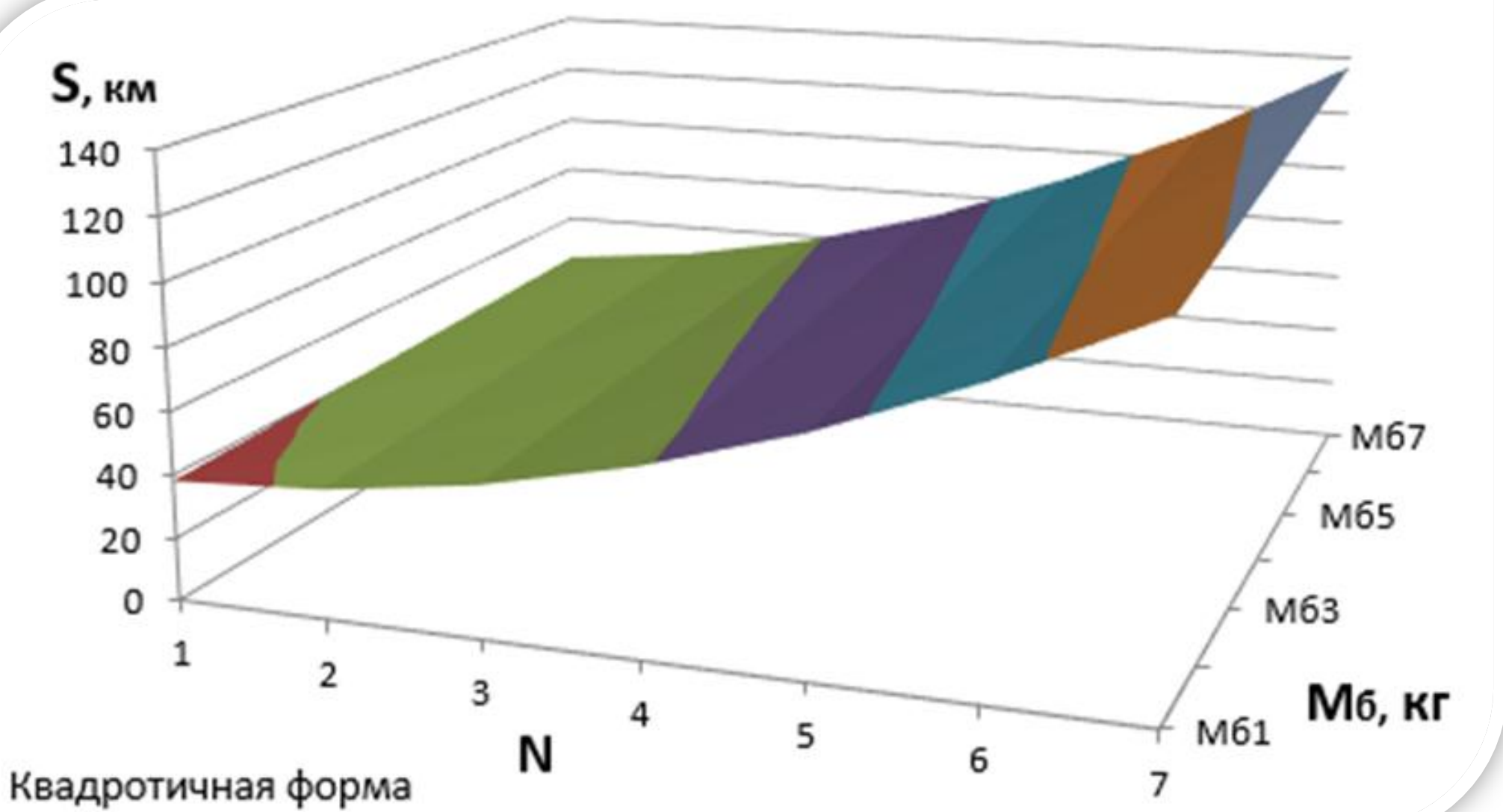
$$I_{pk} = \frac{U_{min} - \sqrt{U_{min}^2 - 4P_k R}}{2R}; \quad \eta_k = \frac{\left(1 + \sqrt{\left(1 - \frac{P_k}{P_{max}}\right)}\right)}{2} \quad P_{уд\,k} = \frac{P_k}{M_б},$$

$$E_{уд\,k} = \frac{P_k}{M_б} t_k,$$

Discharge curves for various power sources

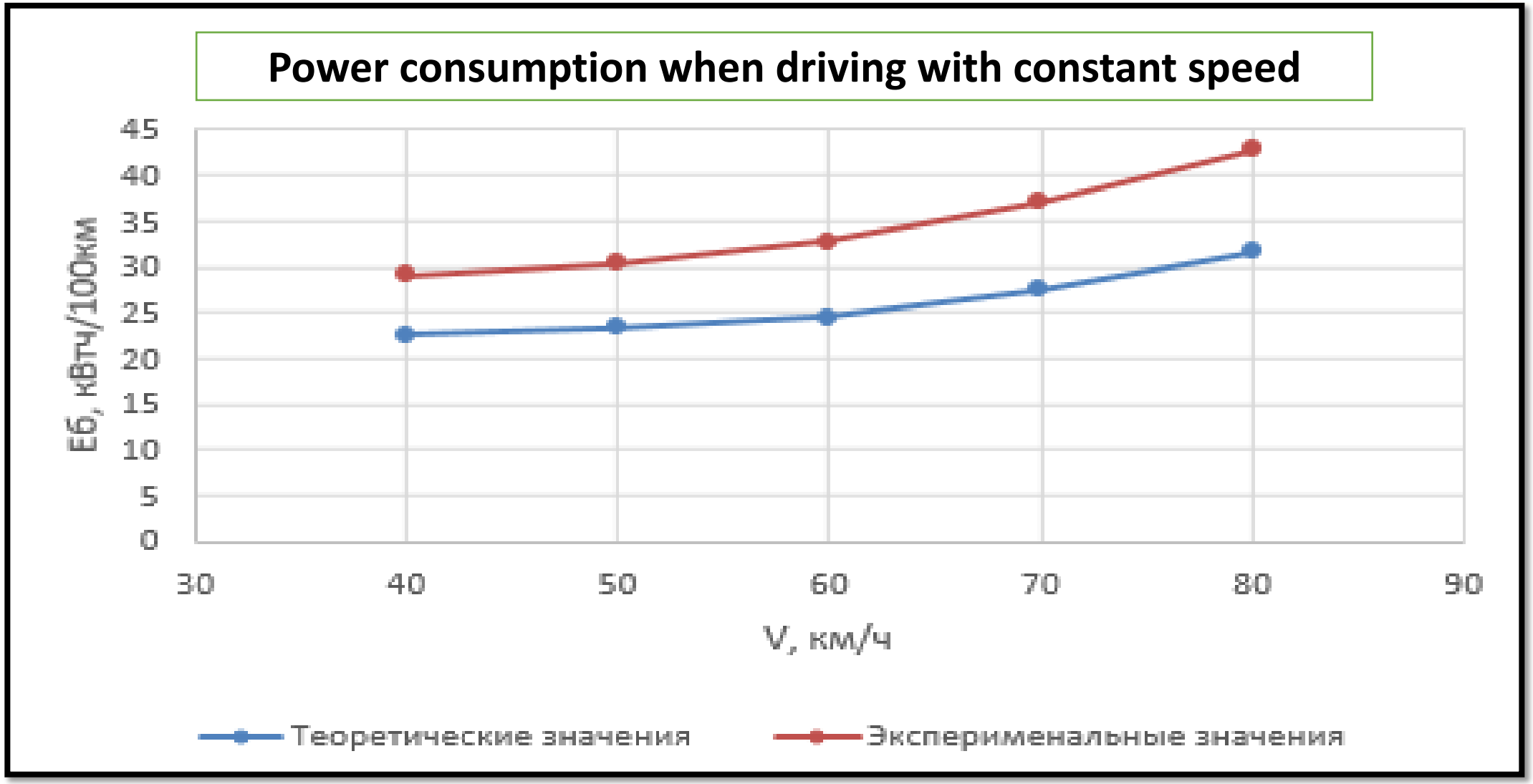


Calculation results



Experimental research

Experiment results



Use of the method

EVA

VAHTAN

GOLD

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Thank you for your attention
Ready to answer your questions

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