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Erasmus+ KA2

Capacity Building in Higher Education

**«Development of practically-oriented student-centred education in
Cyber-Physical Systems modelling» «CybPhys»**

Official number: 609557-EPP-1-2019-1-LV-EPPKA2-CBHE-JP

KhNAHU achievements in the CybPhy

**Presented by:
Professor Andrii Hnatov**

April 28th, 2023



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Kharkiv National Automobile and Highway University

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Team of KhNAHU



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KA2: «CybPhys»

Development, implementation in the educational process and accreditation of new program and courses

University	Course/Lab title	Updated or totally new	Level (Bachelor, Master)	ECTS credit points	The teaching/training methodologies developed/adopted	The link to the university' webpage	Date of accreditation	The status / document of accreditation
KhNAHU	Energy-saving technologies in transport	New	Master	8,5	Lecture, practicals, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1331	autumn 2022	Completed, autumn 2022
KhNAHU	The structure of hybrid and electric vehicles	New	Master	4	Lecture, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1630	autumn 2022	Completed, autumn 2022
KhNAHU	Electric systems of environmentally friendly vehicles	Updated	Master	4	Lecture, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1356	autumn 2022	Completed, autumn 2022
KhNAHU	Methods of planning scientific research on vehicles	Updated	Master	5,5	Lecture, practicals, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1363	autumn 2022	Completed, autumn 2022
KhNAHU	Mathematical modelling and methods of optimization	Updated	Master	3	Lecture, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1733	autumn 2022	Completed, autumn 2022
KhNAHU	Intelligent information technologies and systems in transport	Updated	Master	8,5	Lecture, practicals, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1357	autumn 2022	Completed, autumn 2022



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Accreditation of the DDMP Electric Vehicles and Energy Saving Technologies



СЕРТИФІКАТ ПРО АКРЕДИТАЦІЮ ОСВІТНЬОЇ ПРОГРАМИ

Освітньо-професійна програма

Електромобілі та енергозберігаючі технології

141 Електроенергетика, електротехніка та електромеханіка

другий (магістерський) рівень

Харківський національний автомобільно-дорожній університет
вул. Ярослава Мудрого, 25, Харків, 61002, Україна; ідентифікаційний код 02071168

Дата видачі сертифіката
про акредитацію освітньої програми 29.12.2022

№ 3866

Строк дії сертифіката
про акредитацію освітньої програми 01.07.2028





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Double Diploma Master Program between Riga Technical University and Kharkiv National Automobile and Highway University

An agreement was signed between Riga Technical University and Kharkiv National Automobile and Highway University on the introduction of a Double Degree diploma in the educational process of the master's degree program "**Electric Vehicles and Energy-Saving Technologies**" (within 141 specialties "Electric Power, Electrical Engineering and Electromechanics").





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Minutes of the meeting of the Vehicle Electronics Department

ВИТЯГ

З протоколу №2 засідання кафедри автомобільної електроніки
від 28.10.2022 р.

ПРИСУТНІ: 13 викладачів та співробітників кафедри автомобільної електроніки

СЛУХАЛИ: Про затвердження кандидатур студентів, що навчаються за освітньо-професійною програмою «Електромобілі та енергозберігаючі технології» другого (магістерського) рівня вищої освіти за спеціальністю 141 «Електроенергетика, електротехніка та електромеханіка», галузі знань 14 «Електрична інженерія» на навчання за програмою подвійних дипломів між Ризьким технічним університетом та Харківським національним автомобільно-дорожнім університетом.

ВИСТУПИЛИ: завідувач кафедри автомобільної електроніки, д.т.н., професор Гнатов А.В.

Проведено відбір студентів на навчання за програмою подвійних дипломів другого (магістерського) рівня вищої освіти за спеціальністю 141 «Електроенергетика, електротехніка та електромеханіка», галузі знань 14 «Електрична інженерія» між Ризьким технічним університетом (Professional Master Degree Program "Computerised Control of Electrical Technologies") та Харківським національним автомобільно-дорожнім університетом (Professional Master Degree Program "Electric Vehicles and Energy-Saving Technologies"). Відібрано наступних студентів:

- студент групи АЕ-51-22 Гнатова Ганна Андріївна (Hnatova Hanna);
- студент групи АЕ-52-22 Никоненко Олександр Олександрович (Nykonenko Oleksandr).

Навчання за зазначеною програмою подвійних дипломів проводиться у відповідності до укладеного договору: COOPERATION AGREEMENT concerning a Double Diploma Professional Master Programs Between Riga Technical University - hereinafter referred to as RTU of Professional Master Degree Program Computerised Control of Electrical Technologies and Kharkiv National Automobile and Highway University - hereinafter referred to as KhNAHU of Professional Master Degree Program Electric Vehicles and Energy-Saving Technologies leading to the award of the Double Diploma of Professional Master Degree of Engineering Science in Electrical Science at RTU and of Professional Master Degree of Science in Electrical Engineering at KhNAHU (підписаного в ХНАДУ 26.03.2022 р.).

УХВАЛИЛИ:

1. Затвердити кандидатури студентів на програму подвійних дипломів другого (магістерського) рівня вищої освіти за спеціальністю 141

«Електроенергетика, електротехніка та електромеханіка», галузі знань 14 «Електрична інженерія» на навчання за програмою подвійних дипломів між Ризьким технічним університетом (Professional Master Degree Program "Computerised Control of Electrical Technologies") та Харківським національним автомобільно-дорожнім університетом (Professional Master Degree Program "Electric Vehicles and Energy-Saving Technologies"):

- студент групи АЕ-51-22 Гнатова Ганна Андріївна (Hnatova Hanna);
- студент групи АЕ-52-22 Никоненко Олександр Олександрович (Nykonenko Oleksandr).

ГОЛОСУВАЛИ: «За» - 13
«Проти» - 0
«Утримались» - 0

Завідувач кафедри

(підпис, прізвище та ініціали)

А.В. Гнатов

Секретар кафедри

(підпис, прізвище та ініціали)

Д.В. Марченко

Protocol for approving the candidacies of students studying under the educational and professional program "Electric vehicles and energy-saving technologies" of the second (master's) level of higher education in the specialty 141 "Electric power engineering, electrical engineering and electromechanics", field of knowledge 14 "Electrical engineering" to study under the Double Diploma program between Riga Technical University and Kharkiv National Automobile and Highway University.

Studies at RTU will begin in September 2023.



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Laboratory of Energy-saving technologies in transport

The lab "Laboratory of Energy-saving technologies in transport" was created.





Cyber-Physical Systems for Clean Transportation

Home Publications Research Data Doctoral Theses Scientific Journals of RTU Patents Technology Offers

LV EN

2022
Nadežda Kunicina, Anatolijs Zabašta, Andrejs Romānovs, Jeļena Pečerska, Leonīds Ribickis, Andrii Hnatov, Arhun Shchasiana, Oleksandr Dziubenko, Nataliia Rudenko, Yuriy Borodenko, Kateryna Danylenko, Natalia Morkun, Iryna Zavsiehdashnia, Vladimir Sistuk, Yurii Monastyrskyi, Sergey Ruban, Vitaliy Tron, Joan Peuteman

The content of the material is aimed at specialists in electromechanics and for its proper comprehension certain knowledge is required in special courses (course unit): motor vehicle construction and layout, car electrical, electric motor drive, discrete automation units, automatic control systems. With regard to mechatronic systems of particular purpose, from the control point of view, the ways of implementing control actions are paid the special attention in the book. The methodology of presenting the material expects a sequence of information introduction: the purpose and classification of systems and their component parts; element configuration; the system structure and their functioning; the examples of current industrial prototype systems; conceptual technical solutions involving modern technologies. For better mastering the material, the book contains schematic illustrations and structural diagrams of real life machines. The technical definitions of functional elements and processes, in the text, are given in brackets with the names that are understandable for both electrical specialists and mechanical engineers. The text of the manual is provided with by links to original and additional sources of information. After each part, a list of questions for self-control is given. Also, at the end of the book, there is a list of acronyms and abbreviations.

Keywords
Motor vehicle construction and layout, car electrical, electric motor drive, discrete automation units, automatic control systems

DOI
10.7250/9789934226762

Kunicina, N., Zabašta, A., Romānovs, A., Pečerska, J., Ribickis, L., Hnatov, A., Shchasiana, A., Dziubenko, O., Rudenko, N., Borodenko, Y., Danylenko, K., Morkun, N., Zavsiehdashnia, I., Sistuk, V., Monastyrskyi, Y., Ruban, S., Tron, V., Peuteman, J. Cyber-Physical Systems for Clean Transportation. Rīga: RTU Izdevniecība, 2021. 366 p. ISBN 978-9934-22-676-2.

Publication Type
Academic monograph (one author or a group of authors) for study purposes in HEIs

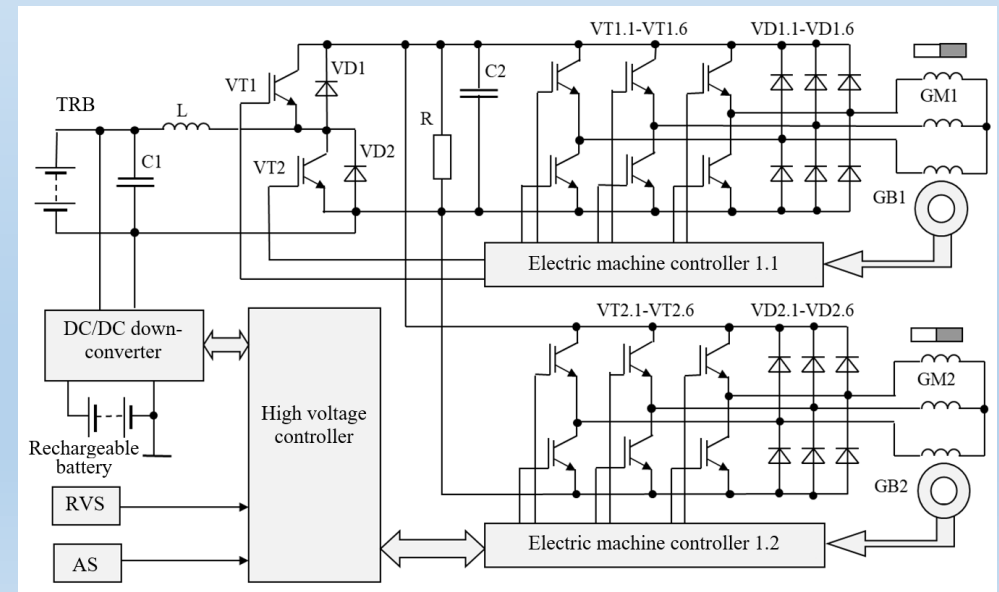
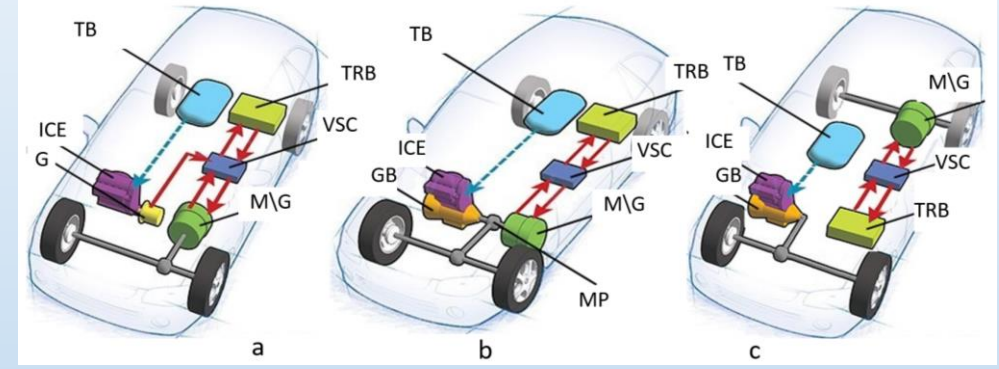
Funding for basic activity
Research project

Field of research
2. Engineering and technology

Sub-field of research
2.2 Electrical engineering, Electronic engineering, Information and communication engineering

Research platform
None

ID: 33238

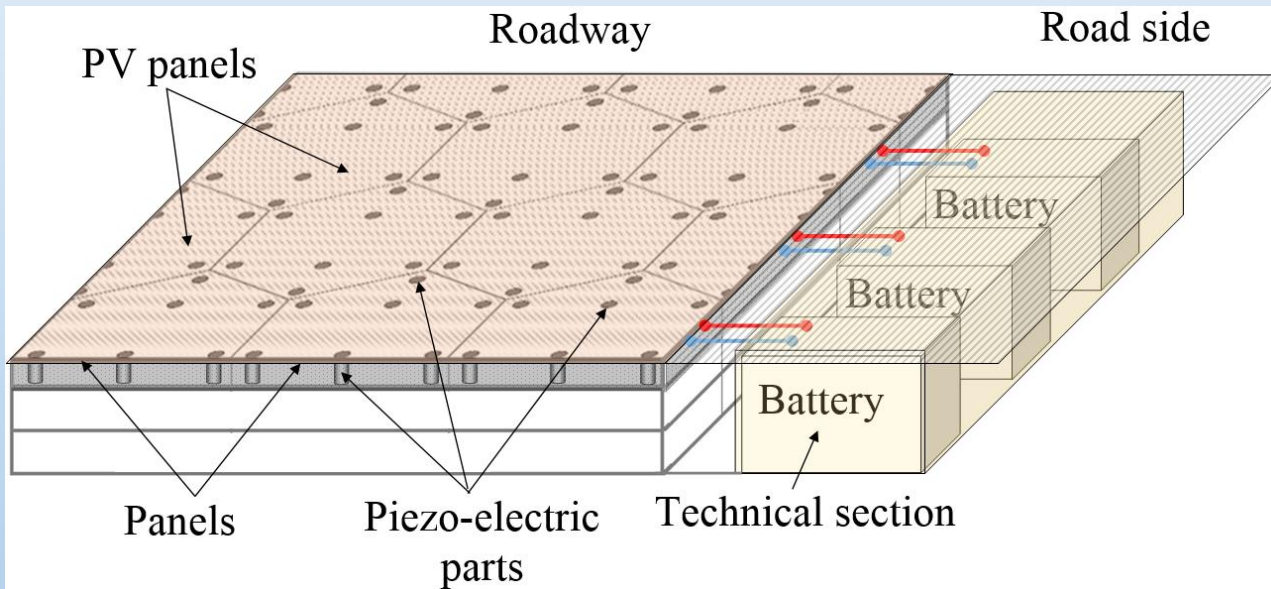


Link: <https://ortus.rtu.lv/science/en/publications/33238>



Energy-saving technologies in transport

1. Multifunctional panels of pavement



At nighttime the dynamic lighting of the road can be performed. For example, the road can be lighted 150-200 m ahead of a moving vehicle.



Road illumination at night; heating of panels in a cold season; drying of a panel by heating; signal system; determining the weight of load on a panel; defining the vehicle travel speed; charging electric cars by solar panels; generating electricity; lightning particular parts of the road; dynamic road lighting in front of a vehicle; warning about the need to reduce the speed if load sensors detect an obstacle on the road.

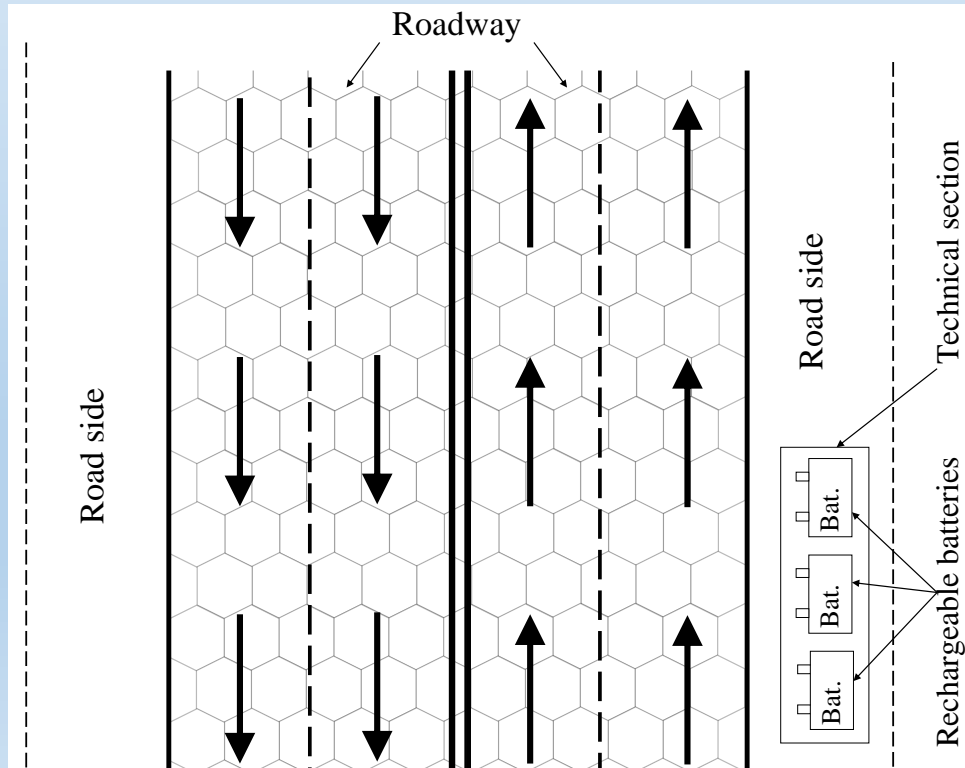


Energy-saving technologies in transport

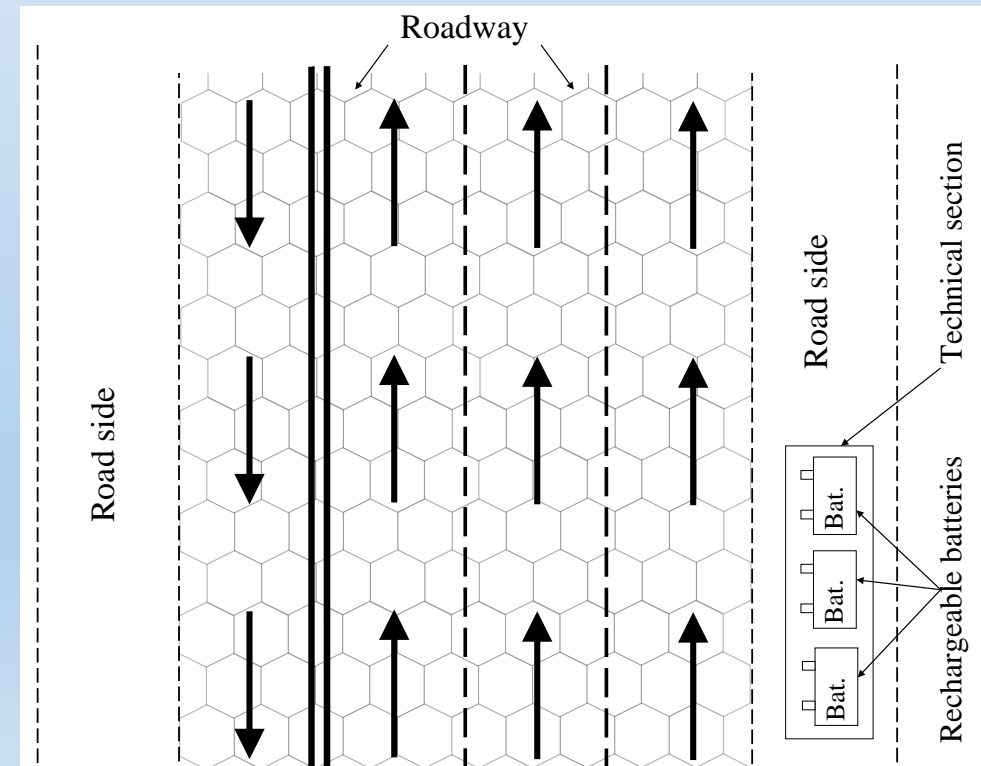
1. Multifunctional panels of pavement

The proposed method of road marking and automatic control of vehicle traffic allows to automatically draw any road markup.

Before the change



After the change





Energy-saving technologies in transport

2. Energy generating platform



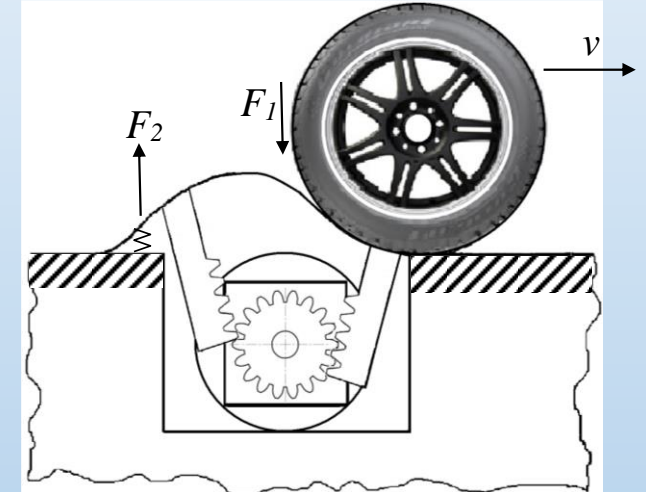
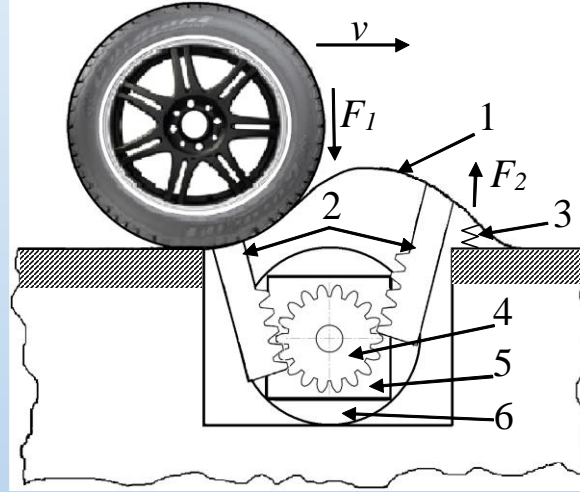
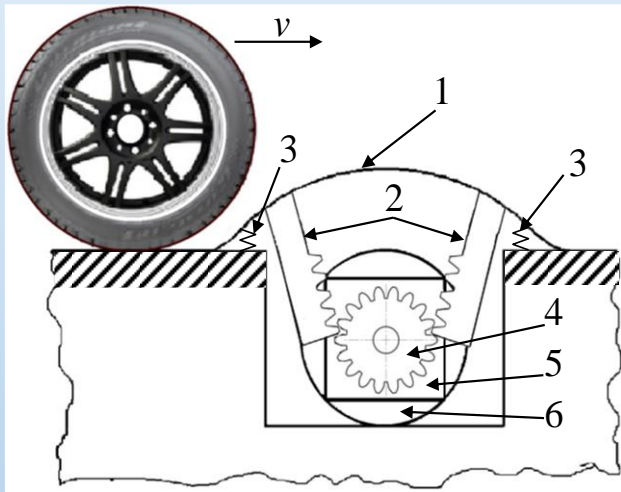
The development of new renewable sources of clean electric energy is an urgent scientific and technical task. To solve it, comprehensive measures are carried out using methods and ways of converting various types of energy into electrical energy. When performing a step on the energy-generating platform, the process of generating electricity is going on, this consists of converting the kinetic energy of the step into electrical energy.



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Energy-saving technologies in transport

3. Device for forced reduction of vehicle speed and generation of green energy



- 1 - a thick plate;
- 2 - the rails of the electric generator drive;
- 3 - springs;
- 4 - drive gear of electric generator;
- 5 - multiplier;
- 6 - electric machine (electric generator).



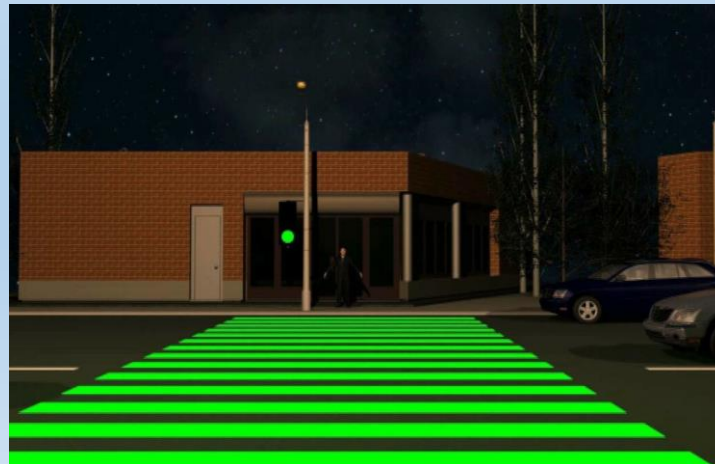


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Energy-saving technologies in transport

Safety and lighting of pedestrian crossings using green energy

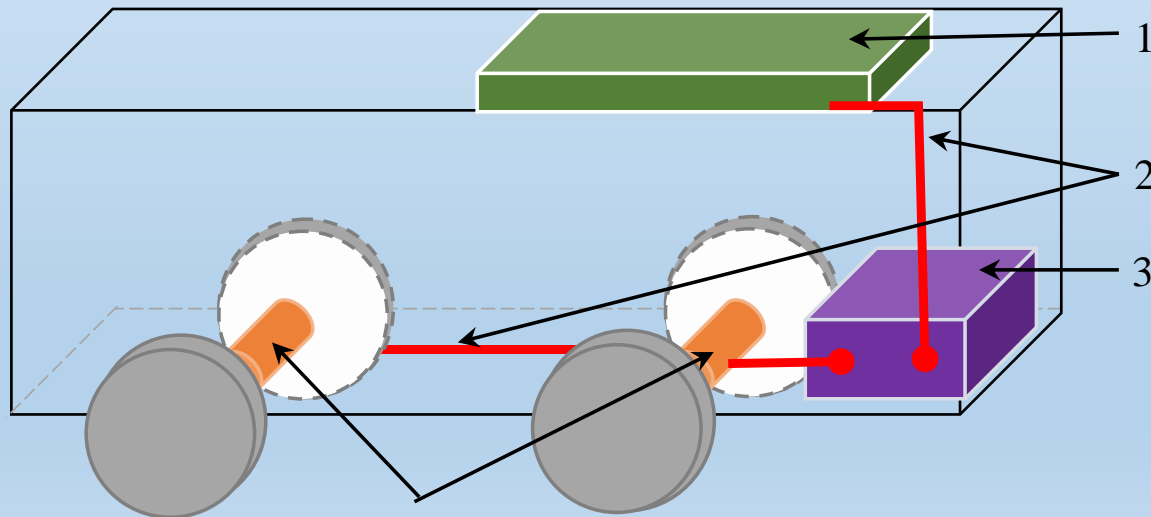




Energy-saving technologies in transport

4. Ultracapacitor electrobus

A new vehicle is an intermediate link between ordinary electric transport and trolleybuses. An electrobus is charged from super-fast charging stations during passengers' loading and unloading, and is capable of going en-route without the necessity of long batteries charging. The charge time is from a few seconds (10...30) to several minutes (determined by the charger power). One charge is enough for 5 km range.



Schematic diagram of an Ultracapacitors electrobus

1 - charger; 2 - lines; 3 - ultracapacitors unit; 4 - electric engines



Implementation area (similar transport)



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