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BASIC DIRECTIONS OF ENERGY-SAVINGS ARE IN PROJECTS OF DEVELOPMENT OF A TRANSPORT INFRASTRUCTURE OF CITIES

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ОСНОВНІ НАПРЯМКИ ЕНЕРГОЗБЕРЕЖЕННЯ В ПРОЕКТАХ РОЗВИТКУ ТРАНСПОРТНОЇ ІНФРАСТРУКТУРИ МІСТ

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ОСНОВНЫЕ НАПРАВЛЕНИЯ ЭНЕРГОСБЕРЕЖЕНИЯ В ПРОЕКТАХ РАЗВИТИЯ ТРАНСПОРТНОЙ ИНФРАСТРУКТУРЫ ГОРОДОВ

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Introduction.

The problem of energy saving is one of the priorities of the state and require urgent solution, especially in energy-intensive industries such as public transportation. To address this pressing need technical re-equipment industry is, to overcome losses by implementing new energy saving technologies and measures.

The purpose of research, problem statement.

Implementation of energy efficiency in transport today represents the actual task. Urban and suburban passenger for transport organizations today are marginally profitable, as the growth rates considerably behind the cost increases, and numerous benefits of travel of various categories of people are not fully compensated by budget allocations. With this basis, there is the need to find effective areas of energy efficiency in transport.

Materials research.

To improve the efficiency of urban passenger transport (MPT) and reduce energy consumption the most effective measures is the implementation of the following projects:

- A comprehensive survey of passenger traffic;
- Development of new routes MPA;
- Improved the existing route network of MPAs;
- Optimization of the structure of rolling stock;
- Optimization of schedules of buses;
- The introduction of separate lanes MPA;
- Introduction of automated systems of dispatching management transport (ASDC);
- The use of biofuels in passenger transport and public utilities;
- Encouraging the development of electric transport.

A necessary component in the development and improvement of route networks is the primary information that enables you to provide more detail the actual process of functioning of the influence of external factors on it. Information can be obtained by making a request on transport enterprises. But the complete information can be collected only passenger survey.

Improving passenger transport can reduce fuel consumption by buses and power generation urban electric transport rolling stock to reallocate route network.

Improvements to the route network structure and rolling stock of public passenger transport. A common problem in many cities is that the routes are mostly small capacity buses (called "minibus"), the majority of which are run by individual carriers.

Studies conducted by the National Transport University for cities of different categories regarding future development of public passenger transport prove that the rational organization of passenger transport in the city of about 300 thousand people, percentage of buses on routes is as follows:

- 3% of buses especially large class;
- 43% of large class buses;
- 38% of buses middle class;
- 16% of small class buses.

To address the optimal composition of vehicles necessary to improve the structure of the park, replacing low-capacity buses on the buses and large middle class. For example in the case of replacement of 35 buses of small class 8 class buses annual emission fuel (LPG) will be 270.83 tons, while diesel fuel spent 144.54 tons. Annual fuel savings equal to 124.83 thousand UAH.

One of the promising directions of the MPA is introducing dedicated lanes for movement of buses and trolley buses (Figure 1). Dedicated lane for public transport - strip intended for traffic priority MPAs in the general movement. It can be selected in any part of the road as in the right lane, and in the middle and left lanes. This band affects the relevant road signs and markings. Technically, this problem is solved in different countries in different ways. In some cities, dedicated band of yellow stripe separates and offenders traveling abroad pay a fine. In many countries, public transport lanes for separating barriers that people and other trucks can not cross physically.

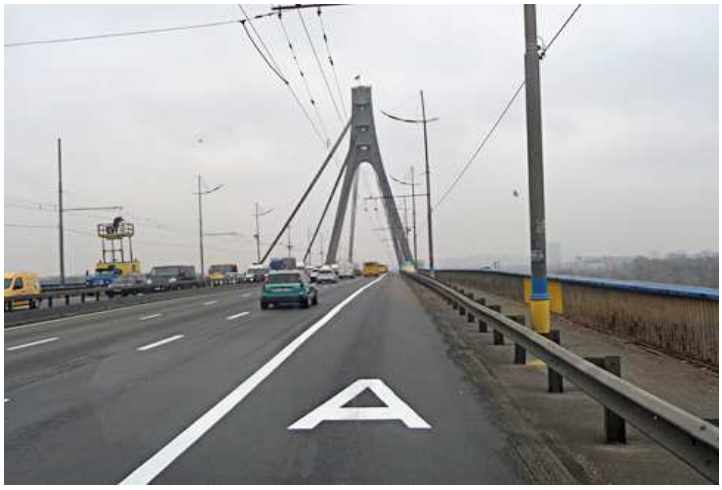

Figure 1 - Dedicated lane for public transport.

To encourage the population to use MPT to prefer personal transport, must be guaranteed the opportunity to make a quick and comfortable trip.

In general, the proposed measures to optimize the route network, improving the structure of the rolling stock, traffic priority MPA, depending on the characteristics of the city can provide reducing power consumption within 5 ... 15%.

The use of biofuels in passenger transport and utilities.

The problem of gas contamination of air traffic in recent years is becoming increasingly important. Poor road network, the presence of a significant number of vehicles with low environmental performance, density of vehicles in peak time and other factors led to an increase in emissions of air and gas pollution from road transport. The solution is the use of biofuels as an alternative to petrol or diesel. Biofuel - a fuel derived from biological raw materials and the processing of biological waste. For automobile engines mainly use biofuels based on ethanol and biodiesel. Ukraine is one of Europe's largest producers of grains and alcohol - ethanol and oilseeds, including canola, which make biodiesel. Biofuel is a mixture of 30 ... 40% dehydrated methanol or ethanol, 70 ... 60% of light fractions of gasoline, esters, hydrocarbons, stabilizers, and special additives that inhibit corrosion and provide safety rubber parts of engine and fuel system of the car.

Biodiesel obtained as a result of chemical reaction with vegetable fats. The most common use rapeseed oil, because it is the cheapest. But you can also use sunflower, corn, soybean and so on.

Biogas - gas obtained in the process of decomposition and fermentation plant, household waste, sewage and other waste under certain conditions (temperature, humidity, acidity). Currently, most European countries use biogas as motor fuel in road transport. The main component of biogas is methane CH4. In the utilities sector all tractors and the vast majority of emergency vehicles running on diesel fuel. The share of trucks on diesel fuel is about 70%. Much of buses equipped with diesel engines. Transfer of biodiesel would significantly improve the environmental situation, especially in cities. Rolling stock equipped with gasoline engines, can be transferred to biofuel (as an example, biofuels E-95-40). For the calculation of ecological effect of transferring 22 buses ZAZ A07A «I-VAN» on biodiesel, estimated emission reductions amount to 775.25 tons of CO2. Moreover, the project requires investment.

Development of measures to reduce energy consumption by road.

Research and improvement of urban transport system. In cities today the very acute problem of congestion traffic flows at the main streets of increased transport activity rate. Typically, most cities have so-called zone of increased transport activity. This usually downloaded intersection, city center, recreation and trade. Improving the transport system of the city transport networks requires research, identification of areas of transport activities and development activities with relief and eliminate traffic congestion during peak hours of traffic.

The main directions of unloading traffic, and hence reducing power consumption by road, in our opinion, are:

- Research and development activities to improve the transport network;
- Introduction of automated control systems transport;
- Encouraging people to use the services of municipal passenger transport;
- Promotion and movement restrictions of check out territory includes the private passenger road transport, parking zones and parking network;
- Limiting entry for the territory of the town of trucks, building logistics terminals and camping;
- Construction of new sections of roads, streets and junctions, change of traffic;
- Encouraging the development of electric transport and combined (hybrid) power plants;
- Development of bicycle infrastructure.

Studies transport network - consuming process associated with significant costs. To study should formalize city transportation network; develop topological scheme; make information gathering, determine for each plot speed transport network traffic and load factor is road traffic, level of service in the network arcs, areas with poor transport network traffic flow conditions [1, 2]. Improving transport network requires a set of measures that take into account the specifics of each city, and can be developed after its investigation. The most common and effective measures, in our opinion, is the construction and expansion of existing roads, junctions, introducing one-way traffic in opposite directions on parallel streets, the introduction of the automated transport management systems [3]. In terms of constant growth of traffic on the main road transport streets reduces the effectiveness of the movement of traditional methods of traffic management.

In this regard it is important to introduce new and more flexible automated transport management systems. The automated system of traffic management (ASUT) - a set of software and technical means and measures to ensure the safety of traffic, improving the quality of road services, optimization of vehicle traffic, data collection and a significant improvement in the environmental situation within the busy highways with vehicular traffic [4]. In ASUT can be integrated into different control system, such as: automated revenue collection system and monitoring premises (ASZVMS) automated system for traffic control (ASTC), automated system of supervisory control surface transport (ASDC). In our view, the most appropriate at an early stage of development is the introduction of such systems:

1) ASZVMS, because mostly caused traffic jams are imperfect system of parking. It starts already at finding drivers parking their cars. The movement in search of parking in peak time causes an increase in traffic of 40%. The introduction of a separate subsystem facilitate the exchange of information between systems and driver that will soon find the right solution and encourage people to discharge the city street network in vehicles through the introduction of payment for parking in the centers of activity, automation and software search process parking spaces;

2) ASUDD as a system that will make it possible to restore and maintain the capacity of the existing road network of the city. ASTC also the base for the implementation of additional surveillance and informing drivers about free parking, traffic issues, and so on.

Experts estimate [5], in implementation ASUDD allows you to:

- 15 ... 20% increase speed train;
- 20 ... 30% to reduce transport delays;

- 10 ... 12% reduced fuel consumption;
- 13 ... 18% to reduce harmful emissions;
- 10 ... 15% lower accident rate on the roads;

3) ASDC as a system that will improve the quality of urban passenger transport in conditions of growing motorization of society. Economic effect after the implementation of ASDC in the city with a population of 300 thousand. People expected due to the following factors: optimizing the use of rolling stock (reducing its number of routes 5%) increase in revenue from transportation (20%), reduction of operating costs (5%), fuel and electricity (10%).

Implementation ASUT and its subsystems in a city of 300 thousand. People in 10 areas of transport activity will enable to reduce peak hour density up to 15 cars. / 1000 m2 DP Estimation of reducing fuel consumption by introducing integrated project ASUT year will be 7446 tonnes. Including the implementation of ASZVMS - 1489.2 t., ASUDD - 5212.2 t., ASDC - 744.6 tons. The total investment for implementing a comprehensive project offer is: 10.7 million USD. Promote restrict the entry and movement of private cars city area of road transport, the creation of parking areas and parking network.

Increasing the level of motorization causes a number of problems related to the large number of vehicles and lack of space for compact storage. In order to stimulate restrict the entry and movement of private cars city area of road transport and unloading of the transport network, in our opinion, can be effective the following measures:

- Prohibit parking of transport on the road, where it impedes movement and prevents the creation of a dedicated band;
- Selection and grading paid parking zones;
- Arrangement of paid parking spaces outside the roadway (in parallel with the introduction of an automated revenue collection system and monitoring premises (ASZVMS));
- The allocation of areas for the creation of a network of parking;
- Creating a network of parking "P + R" (Park & Ride) and "P + G" (Park & Go, and go park).

Build Park and Ride Parking «P + R» (Park & Ride) at main entrances to the city or in peripheral areas or unloaded.

The essence of such sites is that guests and persons who live in the country and working in the city can leave the car parked at catching by paying a small fee for storage and travel benefits received by public transport, transfer to trolleybus, tram or bus and reach the destination, then the same way back, pick up the car and head home.

The suggested technology work sites «P + R»: the owner of the vehicle leave the car in the parking lot, pays and receives preferential parking ticket for 5 trips to any form of public transport. The ticket is valid for parking time. Then the man went public transportation in the city, and after work back to the parking public transport, takes car and leaves for the purpose.

This project is expedient to implement zoning in conjunction with parking in the downtown and in the center of transport activity, and introduce charges for parking in these areas by implementing automated monitoring and pay for parking. It is also possible to consider the option arrangement bike rental at the parking «P + R».

Initially, you can arrange one-level parking on the main green loaded areas (Fig. 2).

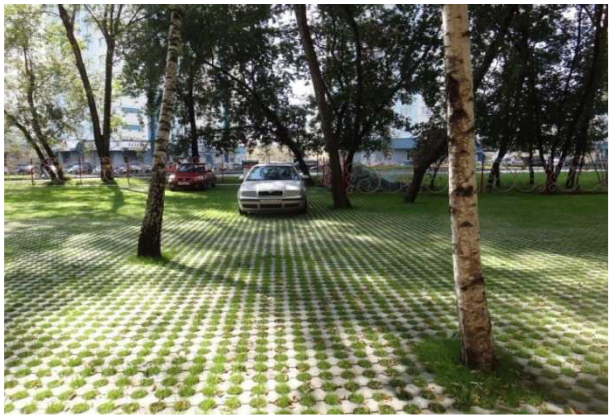

Figure 2 - Green parking

The cost of building parking facilities based service depends on the type of coverage and can vary between 600 USD / m2 (gravel) ... 3000 UAH / m2 (high quality tiles). If you elect coverage Tile domestic production cost of 1500 UAH / m2, the total investment (taking into account the purchase of land) will be about 123.75 million USD.

The approximate effect of network construction parking capacity of 3000 car seats at the entrance to the town with a population of 300 thousand. People in 5 areas is 3547.8 tons reduction in fuel consumption by road. Payback period - 6,27 years. Creating a network of car parks has also concomitant effect unloading transport network during peak hours, which leads to increased speed of traffic flow and, therefore, fuel economy and reducing exhaust emissions, but the definition of this effect requires research. Restrictions to enter the territory of the town of trucks, building logistics terminals and campgrounds. One of the most effective measures to reduce harmful emissions into the atmosphere in the city is the prohibition or restriction of entry to the territory of the city, on its central square and the streets of large trucks that are highly polluting. This is common practice in Europe. Such restrictions are indicated some road signs that inform drivers about the time limit and the type of cars that fall under these restrictions. To provide just outside the city of transit transport, common practice is to build camping. Camping is usually equipped with running water, plates for cooking, a shop, post office, telephone, health care and others. Camping is created to prevent unauthorized organization stands transit traffic and tourists in nature and planned regulation of such facilities. Campsites built, usually in the suburbs, on routes popular tourist routes in green areas, resort areas and tourist centers. Land area camping determined the rate of 100 ... 120 m2 per tourist.

Supplying products, raw materials and production to distribution network bridge requires a significant amount non-transit freight transport, because business processes in large commercial and industrial companies have become so global that transportation and storage services necessary to create storage facilities. Especially difficult to organize the transport and storage of goods, in the case of transfer from one type of transport to another and ensuring customs control. To solve such problems must create a special industrial complex with the appropriate technical equipment to conduct complex operations with goods - logistics terminal. Typically, logistics terminals are built outside cities, places with convenient traffic interchange. The main effect of concomitant opening of logistic terminals is to reduce the burden on road and street network of cities and reducing CO2 emissions from freight transportation by maximizing its output outside the city.

The project to create a logistics terminal at the entrance to the city with an estimated initial capacity of 500 vehicles per day and warehouse area of 20 thousand. M2 (with possible equipment refrigerating chambers, providing storage of goods subject to veterinary and phytosanitary control) gives effect reduction of fuel consumption of trucks to 2463.8 tons per year. The estimated cost of construction of the terminal (warehouses and Regional Planning) - 5000 UAH. / M2, the total investment (including purchase of land) will be about 115 million USD. Tentative payback period - 5.25 years. Construction of new sections of roads, streets and junctions, change of movement. Given the gradual increase in the number of cars in urban areas, effective measures to reduce emissions should be linked to improving the quality of vehicles, the transition to European standards (Euro 6) makes use of advanced gasoline biofuels. But the most substantial measures to reduce energy consumption in transport (on a level with the introduction of automated control systems) are:

- Construction and reconstruction of roads, both urban and bypass, expansion and construction of additional lanes;
- The construction and modernization of transport junctions (Fig. 3);
- Breeding road flows the main streets, forming movements parallel streets oncoming flow.

The implementation of the proposed measures enables significantly reduce the density of traffic and reduce vehicle runs in the city, which, respectively, significantly contributes to reducing fuel consumption.

Construction of roads and interchanges, of course, is a very capital-intensive measures. According to the State Road Research Institute, in Ukraine as of 2014 estimated the cost of building 1 km of road I-category is 40.7 million UAH, II-nd category - 21,6 million, III-category - 19 36 million, IV-category - 10.7 mln. UAH, V-category - 2.2 mln. UAH. Major repairs or reconstruction of the Ukrainian roads costs the following amounts: I-st category - 24.8 million USD for 1 km, II-nd - 12.98 million UAH, III-th - 11.66 million UAH, IV-th - 5 5 mln. UAH, V-th - 1.32 million USD.

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Figure 3 - The project of construction of transport interchanges in Kiev

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In addition, the implementation of these measures is often impossible due to lack of space in the city that could be used for expansion of roads and construction of interchanges. After all, when creating master plans and urban development construction projects areas, neighborhoods etc. are not taken into account as a significant increase in the number of cars. However, where possible, such projects should be promoted.

If you can not build new facilities, can be effective redirection of traffic and the introduction of one-way traffic. In some cases, such measures lead to a slight increase in vehicle runs, but significantly unloaded traffic flows.

In addition to the environmental and social impact implementation of the above measures could lead to significant revenue in the long run.

The most significant results from the implementation of the above measures are the following:

• reducing congestion in the city;
• increasing transport accessibility of neighborhoods;
• increase in average operating speeds of vehicles compared to current driving conditions;
• reducing the number of accidents related to poor road conditions;
• reducing the operating costs of road transport and unproductive loss of time passengers and goods, educing transportation costs;
• reduce the negative impact on the environment.

Conclusions: The present condition and problems in energy intensity, energy conservation and energy efficiency in the transport sector, the analysis of world experience in implementing projects and programs to improve energy efficiency in the transport sector. Development and implementation of such projects requires preliminary studies, preparation of detailed feasibility studies, approval of the local authorities. It is advisable to take into account the cost of design and preparatory works, works of dismantling buildings, earthworks, works on improvement of infrastructure facilities. Resulted in the measures will reduce the consumption of different resources, thereby reducing costs and increase profitability.

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ПЕРЕЛІК ПОСИЛАНЬ

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ABSTRACT

Grysiuk Y.S., Pustovoitenko S.V., Labuta A.V. Basic directions of energy-savings are in the projects of development of a transport infrastructure of cities. Science journal: In Part 2. Part 2: Series: "Economic sciences " - Kyiv: NTU, 2014. - Vol. 14.

The paper examines the main trends in energy efficiency projects of transport infrastructure.

Object of study - transport infrastructure.

Purpose - energy efficiency of transport infrastructure.

Methods - Theory analysis method of peer reviews.

To improve the efficiency of public passenger transport (PPT) and reduction of power most effective measure is the implementation of the following projects:

- A comprehensive survey of passenger traffic;
- Development of new routes PPT;
- Improved the existing route network PPT;
- Optimization of rolling stock;
- Optimization of schedules of buses;
- Introduction of separate lanes PPT;
- Introduction of automated systems of dispatching management of transport;
- The use of biofuels in public transport and public utilities;
- Encouraging the development of electric transport.

Development and implementation of such projects requires previous studies, preparation of detailed feasibility studies, coordination with local authorities. It is advisable to take into account the cost

of design and preparatory works, works of dismantling buildings, earthworks, works on construction of infrastructure facilities. Are given in the measures will reduce the consumption of different resources, thereby reducing costs and increase profitability.

The results of the article can be used in practice to improve the functioning of public passenger transport.

Projected assumptions about the object of study - the applicability of the results of projects implemented to further increase efficiency transport infrastructure.

KEYWORDS: ENERGY EFFICIENCY, INFRASTRUCTURE,TRANSPORT, ROUTE CHAIN, STOCK.

РЕФЕРАТ

Грисюк Ю.С. Основні напрямки енергозбереження в проектах розвитку транспортної інфраструктури міст. / Ю.С Грисюк, С.В. Пустовойтенко, А.В. Лабута // Управління проектами, системний аналіз і логістика. Науковий журнал: в 2 ч. Ч. 2: Серія: „Економічні науки" – К. : НТУ, 2014. – Вип. 14.

В статті досліджуються основні напрями підвищення енергоефективності в проектах розвитку транспортної інфраструктури міст.

Об'єкт дослідження – транспортна інфраструктура.

Мета роботи – підвищення енергоефективності транспортної інфраструктури.

Методи дослідження – теорія аналізу, метод експертних оцінок.

Для підвищення ефективності функціонування міського пасажирського транспорту (МПТ) та зменшення енерговитрат найбільш дієвими заходами є реалізація наступних проектів:

- комплексне обстеження пасажиропотоків;
- розробка нових маршрутів МПТ;
- вдосконалених існуючої маршрутної мережі МПТ;
- оптимізація структури парку рухомого складу;
- оптимізація графіків руху автобусів;
- введення окремої смуги руху МПТ;
- впровадження автоматизованих систем диспетчерського управління транспортом;
- використання біопалива на пасажирському транспорті та в комунальному господарстві;
- стимулювання розвитку електротранспорту.

Розробка та реалізація таких проектів вимагає попередніх досліджень, підготовки детального техніко-економічного обгрунтування, погодження з органами місцевого самоврядування. Доцільно також враховувати вартість проектних та підготовчих робіт, робіт з демонтажу будівель, споруд, земляних робіт, робіт з облаштування інфраструктурних об'єктів. Приведені в роботі заходи дозволять зменшити споживання різних видів ресурсів, тим самим зменшивши витрати та підвищити рентабельність.

Результати статті можуть бути використані на практиці для підвищення ефективності функціонування міського пасажирського транспорту.

Прогнозні припущення щодо розвитку об'єкта дослідження – можливість застосування результатів реалізованих проектів для подальшого підвищення енергоефективності транспортної інфраструктури міст.

КЛЮЧОВІ СЛОВА: ЕНЕРГОЗБЕРЕЖЕННЯ, ІНФРАСТРУКТУРА, ТРАНСПОРТ, МАРШРУТНА МЕРЕЖА, РУХОМИЙ СКЛАД.

РЕФЕРАТ

Грисюк Ю.С. Основные направления энергосбережения в проектах развития транспортной инфраструктуры городов. / Ю.С Грисюк, С.В. Пустовойтенко, А.В. Лабута // Управление проектами, системный анализ и логистика. Научный журнал: в 2 ч. Ч. 2: Серия: „Экономические науки" – К. : НТУ, 2014. – Вип. 14.

В статье исследуются основные направления повышения энергоэффективности в проектах развития транспортной инфраструктуры городов.

Объект исследования - транспортная инфраструктура.

Цель работы - повышение энергоэффективности транспортной инфраструктуры.

Методы исследования - теория анализа, метод экспертных оценок.

Для повышения эффективности функционирования городского пассажирского транспорта (ГПТ) и уменьшения энергозатрат наиболее действенными мерами являются реализация следующих проектов:

- Комплексное обследование пассажиропотоков;
- Разработка новых маршрутов ГПТ;
- Усовершенствованных существующей маршрутной сети ГПТ;
- Оптимизация структуры парка подвижного состава;
- Оптимизация графиков движения автобусов;
- Введение отдельной полосы движения ГПТ;
- Внедрение автоматизированных систем диспетчерского управления транспортом;
- Использование биотоплива на пассажирском транспорте и в коммунальном хозяйстве;
- Стимулирование развития электротранспорта.

Разработка и реализация таких проектов требует предварительных исследований, подготовки детального технико-экономического обоснования, согласования с органами местного самоуправления. Целесообразно также учитывать стоимость проектных и подготовительных работ, работ по демонтажу зданий, сооружений, земляных работ, работ по обустройству инфраструктурных объектов. Приведенные в работе мероприятия позволят уменьшить потребление различных видов ресурсов, тем самым уменьшив расходы и повысить рентабельность.

Результаты статьи могут быть использованы на практике для повышения эффективности функционирования городского пассажирского транспорта.

Прогнозные предположения о развитии объекта исследования - возможность применения результатов реализованных проектов для дальнейшего повышения энергоэффективности транспортной инфраструктуры городов.

КЛЮЧЕВЫЕ СЛОВА: ЭНЕРГОСБЕРЕЖЕНИЕ, ИНФРАСТРУКТУРА, ТРАНСПОРТ, МАРШРУТНАЯ СЕТЬ, ПОДВИЖНОЙ СОСТАВ.

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