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INTELLECTUAL SYSTEM OF TRACTION POWER SUPPLY OF ELECTRIC ROLLING STOCK

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Introduction. One of the main areas of electricity development is the use of Smart Grid methodology. The Smart Grid concept is a fully integrated, self-regulating and self-renewing power system that has a network topology and includes generating, backbone, distribution networks and electricity consumers that are managed by a single, real-time information system [1].

The implementation of the Smart Grid concept is aimed at ensuring the reliability and energy efficiency of electricity supply, improving the quality of electricity, bandwidth of electrical networks and their controllability, alignment of variable load schedules, organization of monitoring of parameters and control of the state of the grid, integration of renewable energy sources, reduction of grid systems creation of a client-oriented model of functioning of the energy market.

With the development of the Smart Grid concept, there is a need to implement intelligent power supply systems on electric rolling stock and traction substations for rail transport.

Managed power transmissions, thanks to high speed power electronics, are able to quickly affect the processes occurring in power systems, thereby transmitting power from passive means of electricity transportation to active operating modes.

The basis of smart grids is the methodology of distributed power management. In most countries of the world a single vertically integrated dispatching system is used: automated substation control system – regional dispatcher – power system dispatcher – central dispatcher [2].

Presentation of the material. Traction power supply for the application of the methodology of smart grids can be considered as one of the types of distribution networks, and the depth of control of the power supply mode can be considered to end consumers – electric rolling stock. In this case, it is advisable to place the data center on the traction substation and arrange the rolling stock links via the contact network or using radio communication (Fig. 1). The function of the settlement center is the processing of information about the power supply mode (voltages on all switchgear, currents and power factors of all components, information on the state of the equipment). These functions are performed in real time, so all equipment must be securely connected.

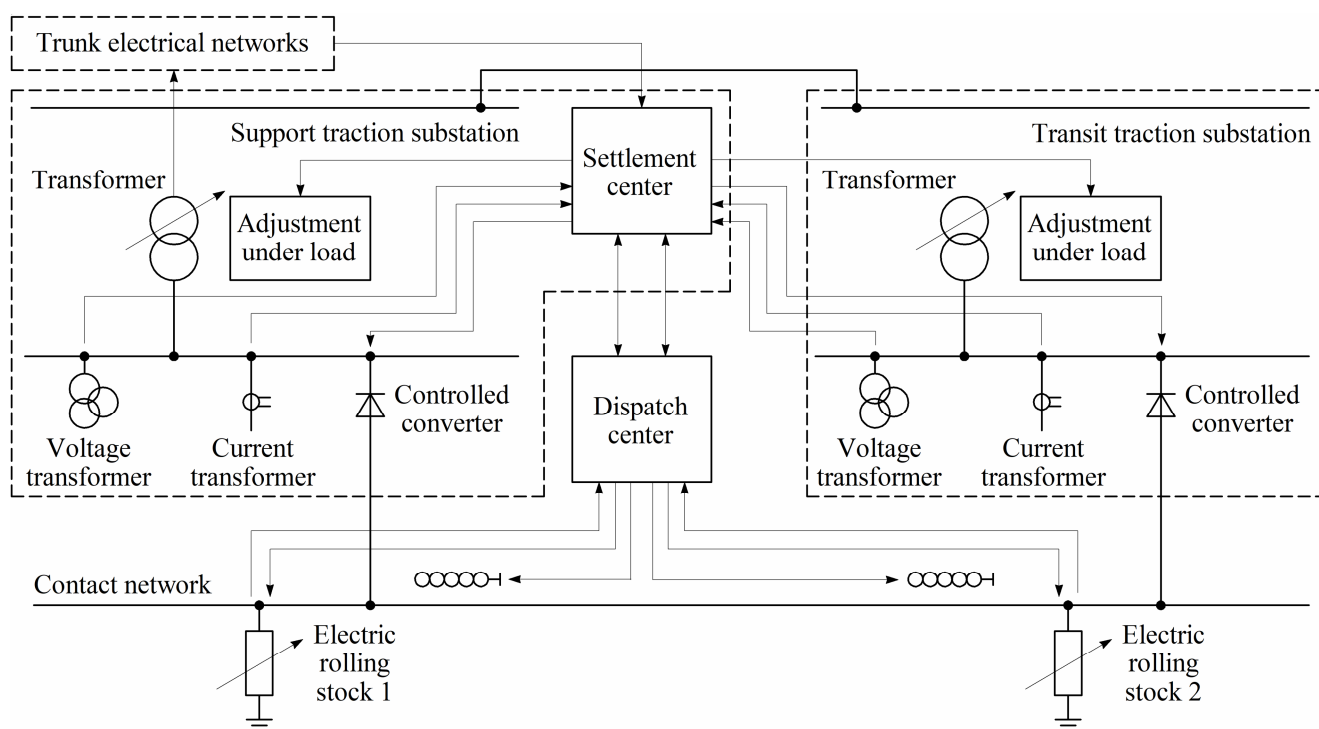


Figure 1 – Implementation of the methodology of smart grids in the railway power supply system

As sources of information in distribution networks, in addition to voltage transformers and current transformers, it is necessary to use "smart" electricity metering, which transmits information about electricity consumption to the settlement center in real time.

Since consumer electricity is a priority for the electricity company, the functions of the settlement center of the distribution network are not so much in the formation of control signals, but in the formulation of proposals to the consumer of electricity to change the parameters of the power supply mode, such as prevailing electricity consumption at certain hours of the day, the desire to perform reconstruction and use of reactive power compensation and other energy-saving and energy-efficient measures orystannya electrical system resources.

The control of traction power supply mode must ensure reliable passage of trains on the site, so when organizing an intelligent traction power supply network, it is necessary to provide for integration (communication channel) of the settlement center with the dispatch center, and one of the types of control effects should be to control traffic signals, which provide traffic lights priority trains when voltage regulation at the substations of the section is not possible with power equipment of intelligent networks (devices regulating load under transformers, controlled converters).

It should be noted that, compared to the electrical distribution networks, the railway power supply system is administratively integrated with the traffic management system, which eliminates the recommended status of control signals. Such administrative subordination is a significant advantage, including for the railway power supply system, allows for deep control of the power supply regime using administrative methods of influencing electricity consumers and, as a result, optimizing the transportation process.

The electric drive used in the electric warehouse of the railways causes a significant emission of higher harmonics of traction currents to the contact network and electric rail circuits of the railway automatics, which exacerbates the issue of the quality of electrical energy in the contact network and electromagnetic compatibility of traction currents and railway automatics [3, 4]. Increasing the energy efficiency of traction power systems is possible through the use of energy efficient semiconductor converters, which will enable the implementation of the principles of smart grid systems Smart Grid, improve the efficiency of traction power and traction systems and reduce electricity consumption. In intelligent electrical networks, the use of active converters with correction of the power factor is promising, which will increase the electromagnetic compatibility with the power supply network and realize a power factor close to one, the possibility of forming an

input current close to sinusoid, and also the implementation of the mode of energy recovery to the power supply network [5].

Conclusion. The concept of applying the methodology of smart grids Smart Grid in the power supply system of rail transport will improve the efficiency of the use of backbone and distribution networks. The proposed methodology is based on the use of unlimited computing power of electronic computers and advanced communication systems. Algorithmization of the control effects on the equipment of the smart grids should be performed in each case in the process of development of design documentation for the modernization (construction) of the section of the electrified railway.

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CHALLENGES IN DELIVERY OF DANGEROUS CARGO BY ROAD TRANSPORT

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Introduction. Delivery of dangerous cargo is a specific type of delivery by road transport. The priority for such delivery is to ensure traffic safety, which requires continuous improvement of all links in the technology of delivery.

Outline of the material. Delivery of dangerous cargoes is an activity related to the transfer of dangerous goods from their place of manufacture or storage to their destination with preparation of cargo, containers, vehicles and crew, acceptance of cargo, carrying out of cargo operations and short-term storage of cargo at all stages of delivery. Thus, delivery of dangerous cargo by road is a complex and time-consuming process that requires special attention from consignors, consignees and carriers. [1].

The current market situation shows that most heads of organizations in various fields prefer to deliver cargo by road. More than 20% is delivery of dangerous cargo. Every year, worldwide, the number of industries that create or use a huge amount of harmful substances is increasing. These substances move along country roads and cross the borders of many countries [2].

In order to prevent possible damage to the dangerous cargo transportation, freight forwarding companies face a number of problems associated with improving the safety of transportation. Conditionally they can be divided into the organization of the transport process, regulation of transportation, management of transportation, elimination of consequences of accidents [3].

Particular attention is paid to the regulation of transportation, namely the development of uniform rules and regulations for the transportation of dangerous cargo, which will allow them to carry out their standardization and unification [4]. However, the regulatory framework at this stage in the field of transportation and supervision of dangerous cargo is not well developed. Although Ukraine acceded to the European Agreement on the International Carriage of Dangerous Goods by