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**INNOVATION MECHANISMS OF THE INTERACTION
OF POWER SUPPLYING AND POWER DISTRIBUTING
ENTERPRISES OF THE HOUSING AND PUBLIC UTILITY
SECTOR AND UPGRADING OF THE QUALITY OF SERVICES**

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Abstract: The article analyzes the existing mechanisms of interaction between power supply and power distribution enterprises in the sphere of housing and public utility to provide uninterrupted power supply to apartment buildings. One of the approaches to improving existing and developing new innovative mechanisms of interaction of these enterprises is offered. A fundamentally new system of power supply of apartment buildings is substantiated. The presence of the influence of new innovative mechanisms on improving the quality of housing and public utility (on the example of indicators of the quality of electric power) is established.

Key words: housing and public utility sector, housing and public utility, power supply, innovative mechanisms of interaction, quality upgrading.

**ИННОВАЦИОННЫЕ МЕХАНИЗМЫ ВЗАИМОДЕЙСТВИЯ
ЭНЕРГОСНАБЖАЮЩИХ И ЭНЕРГОРАСПРЕДЕЛЯЮЩИХ
ПРЕДПРИЯТИЙ СФЕРЫ ЖИЛИЩНО-КОММУНАЛЬНОГО
ХОЗЯЙСТВА И ПОВЫШЕНИЕ КАЧЕСТВА УСЛУГ**

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Аннотация: В статье проведен анализ существующих механизмов взаимодействия энергоснабжающих и энергораспределяющих предприятий сферы жилищно-коммунального хозяйства по обеспечению бесперебойного электроснабжения многоквартирных жилых домов. Предложен один из подходов совершенствования существующих и разработки новых инновационных механизмов взаимодействия указанных предприятий. Обоснована принципиально новая система электроснабжения многоквартирных жилых домов. Установлено наличие влияния новых инновационных механизмов на повышение показателей качества жилищно-коммунальных услуг (на примере показателей качества электрической энергии).

Ключевые слова: сфера жилищно-коммунального хозяйства, жилищно-коммунальные услуги, электроснабжение, инновационные механизмы взаимодействия, повышение качества.

Introduction

The practice of implementing of market transformations in the field of housing- is based on the main provisions of the modern legislative and regulatory framework, which are defined in the Housing Code of the Russian Federation (approved at the legislative level) [1], the Strategy for the Development of Housing and public utility services in the Russian Federation for the period up to 2020 [2], the Comprehensive Program for the Reform and Modernization of Housing and Public Utility Services for the period 2010-2020 [3] (approved at the level of the Government of the Russian Federation), as well as numerous programs of comprehensive modernization and effective development of the housing and utilities sector of regions and municipalities (approved at the regional and municipal levels of government). Currently, the Strategy for the Development of the construction industry and housing and utility services of the Russian Federation until 2035 is under development [4].

These documents clearly define the housing stock as the main object of management in the housing and utilities sector. Moreover, it is precisely on the issues of management and implementation of the current operation of the housing stock that there is a need to implement various kinds of interactions between housing and public utility enterprises based on the use of existing or the development of new innovative mechanisms. At the same time, any enterprise that carries out this kind of interaction can easily be represented as an institutional agent of the housing and utilities sector.

Therefore, it is quite logical that it pursues its own goals and interests, which are primarily focused on making a profit and ensuring the effectiveness of its activities. At the same time, a specific feature of the activities of housing and public utility enterprises is its diverse functional orientation [5]. The presence of this feature leads to the fact that effective interaction mechanisms for one may not be the same for other enterprises. This implies the need to improve existing and develop new innovative mechanisms for interaction between housing and public utility enterprises. They are designed to ensure the functioning of enterprises in this sphere, subject to an acceptable level of efficiency and the maximum possible compliance with the interests of all participants.

Research purpose

The main purpose of the study was to analyze innovative mechanisms of interaction between economic entities of housing and public utility services and to identify their impact on improving the quality of housing and public utility services.

Material and methods

Being the main object of management in the field of housing and public utility services, the housing stock itself cannot be used by its owners and tenants, except for the implementation of property rights or hiring. Owners and employers become holders of these rights after passing the established registration procedure or concluding lease agreements (leases, etc.). In addition to the possession of these rights, for the owners and tenants of housing, its provision with a complex of housing and public utility services is of great importance. Its availability and uninterrupted provision makes the housing stock suitable for living.

No less important is the compliance of the housing and public utility services complex with the requirements of sanitary rules and regulations (SanPiNs), which are established for each specific service provided to owners and tenants of housing as a tangible result of the activities of housing and public utility enterprises. Compliance with sanitary rules and regulations makes it necessary to solve the problem of carrying out a comprehensive modernization of municipal, network and other infrastructure facilities. Its result should be the full compliance of the quality characteristics of the housing provided to owners and tenants with the modern requirements of SanPiNs. On this basis, it can be concluded that maintaining the established indicators of the quality characteristics of the housing and public utility complex is of great importance in carrying out a comprehensive modernization of the housing and public utility infrastructure and ensuring its effective development [6].

If we consider the issues of ensuring the quality of housing and public utility more broadly, it is not difficult to notice that a significant part of the owners and tenants of housing can be interpreted as the able-bodied population of our country. It is his labor activity at enterprises and industrial productions of the domestic economy that ensures its normal functioning and sustainable development. In solving this problem, the determining role belongs to ensuring the efficiency and high level of qualification of the personnel of enterprises, as well as the growth of labor productivity. To achieve this, it is necessary not only to create favorable working conditions at work, but also to make sure that the living conditions of the able-bodied population also correspond to the modern level of comfort through the provision of a housing and public utility complex of appropriate quality. The availability of comfortable housing and the provision of high-quality housing and public utility can become the basis for supporting the high efficiency of the personnel of enterprises. The result of this should be an increase in labor productivity, which means a successful modernization of the entire infrastructure of the Russian economy and its effective development as a whole.

One of the promising areas for improving the quality of housing and public utility is the organization of uninterrupted supply of residential buildings with electric power while observing the established quality parameters. Its implementation required the introduction of innovative interaction mechanisms from power supply and power distribution enterprises in the housing and public utility sector [7]. For the supply of electric power to multi-apartment residential buildings (MRD) in the microdistricts of many cities in Russia, general-purpose electric networks are used. The technical conditions of their operation and the equipment installed for these purposes allow the presence of high-frequency noise, exceeding the permissible values of the current frequency deviation indicators, frequent voltage surges and significant losses of electrical power during its transmission and distribution. The consequence of these and other shortcomings are periodic disconnections of the MRD from the power supply. Accidents in electrical networks, as well as natural anomalies and various kinds of man-made disasters can lead to power outages. In many respects, the increased wear and imperfection of the equipment used, as well as the lack of effective power supply systems and backup capacities contribute to the power supply shutdown. According to these and a number of other parameters, the quality indicators of providing electric energy (PEE) they no longer meet the requirements of modern standards.

Many residents of our country, regardless of whether they are owners or tenants of housing, most likely got into various situations related to power outages. Therefore, every resident is well aware of all the negative consequences associated with even a short-term shutdown. This is not only the lack of lighting, water, non-working elevators, but also the complete uselessness of all household appliances, electric stoves and appliances. Naturally, such situations are unacceptable when supplying electricity to modern MRD, but, nevertheless, they happen quite often. This circumstance has become another reason for the need to modernize general-purpose electric networks and electricity distribution infrastructure.

Today, the real situation is that general-purpose electric networks have low PCE values. The requirements for the permissible values of the PCE are established by the Interstate Standard GOST 13109-97 [8]. At the same time, they are not high enough in relation to modern high-tech equipment. Therefore, it is not by chance that the State Center for Metrological Support in the Field of Electromagnetic Compatibility (SCMS FEC) issues numerous conclusions, according to which the requirements of GOST 13109-97 to the PCE by power supply and power distribution enterprises in the housing and utilities sector are usually not fulfilled [9]. Direct connection to general-purpose electrical networks of home computers and other high-tech equipment that is sensitive to the deterioration of the quality of electrical power may entail the risk of disruption of its normal performance, and in some cases even breakage.

In general, PCE characterize the aggregate properties of electrical power, which determine its effect on electrical equipment. New requirements and norms for monitoring and measuring the PCE in the supply of the electric power to owners and tenants of housing are established by GOST 32144-2013 and 33073-2014 [10, 11]. Their implementation, as well as the implementation of the basic principles for the creation and operation of MRD power supply systems in urban microdistricts, should ensure their uninterrupted power supply with a high degree of reliability in the near future. These principles include the following:

- the main power supply system must have a sufficient supply of power for uninterrupted power supply to the MRD in the microdistricts of cities, provided that the loads increase;
- the main power supply system must have backup power sources available, in case of unplanned outages and accidents;
- the main power supply system must take into account the requirements of the environmental protection.

Results and discussion

Power supply and power distribution enterprises in the housing and public utilities sector should increase the PCE by providing direct supply and distribution of the electric power, uninterrupted power supply to the MRD in the microdistricts of cities. To do this, they will have to expand the practice of using innovative interaction mechanisms in order to improve the reliability of existing power supply systems. As you know, the electric networks of urban microdistricts are a set of power transmission lines from electrical installations located on their territories – power supply centers (SC), distribution points (DP) and transformer substations (TS). It is they who carry out the power supply of the MRD in the microdistricts of cities, which mainly belong to the consumers of the first category. For such consumers, the improvement of existing power supply systems may include the parallel operation of supply lines with automatic switching on of backup power (ABP), as well as the expansion of the practice of using ring power supply schemes. To do this, the power transmission lines of the SC of each TS are connected to each other in a ring, similarly, the power lines of the DP of each TS are connected, as well as the power lines between the TS. Such a power supply system provides the highest reliability of power supply, since:

- 1) at least two independent sources and, accordingly, two parallel power lines are always used to supply electric energy to the MRD in the microdistricts of cities;
- 2) in case of failure of one of the sources or one power line, the power load will be automatically transferred to another source or power line using the automatic reserve switching device (RSD).

The transition of power supply and power distribution enterprises of the housing and public utilities sector to such schemes is all the more expedient, since in addition to residential premises of owners and tenants of housing in the MRD there are general household consumers of the electric power. These include, first of all, cargo and passenger elevators, fire alarm systems, evacuation, smoke removal and fire extinguishing, as well as lighting of public areas and adjacent territories. Of course, these consumers are important for the normal living of owners and tenants of housing and for this reason they should be connected to power sources most reliably.

Naturally, the implementation of this and other mechanisms of interaction between power supply and power distribution enterprises in the housing and public utilities sector should be carried out on the basis of the conclusion of appropriate contracts between all participants, as well as between each enterprise and the housing department of the city education or municipality.

Opinions

As a result of the conducted research, it was found that the reform of the housing and public utilities sector is not going fast enough. This has a negative impact not only on the quality of housing and public utilities provided to owners and tenants, but also on the effective development of this sphere and other sectors of the Russian economy. It is proved that the power supply and power distribution enterprises that provide electricity to the MRD in the microdistricts of cities can be attributed to the institutional agents of the housing and public utilities sector. As innovative mechanisms of their interaction, the transition to fundamentally new MRD power supply systems that provide high reliability and uninterrupted operation is proposed. The expansion of these approaches in practice and the transition to improved power supply systems will require additional costs from power supply and power distribution enterprises to introduce innovative interaction mechanisms and improve the quality of housing and public utilities services. However, these costs can be quickly recouped by improving the reliability of electricity supply and the quality of supply of the electric power to owners and tenants of housing, as one of the most important services.

Bibliography

1. Dwelling Code of the Russian Federation. – M.: Normatica, 2017. – 160 p.
2. Strategy of the development of the housing and public utility sector in the Russian Federation till 2020. Approved by the decree of the RF government № 80-p of January 26 2016.
3. Comprehensive program of the reformation and upgrading of the public utility sector for 2010-2020: decree of the Government: [№ 102-p adopted on February 2 2010]. – M.: Collection of Legislation of the RF, 15.02.2010. №7. Ст.769.
4. Strategy of the development of the construction area and of the public utility of the Russian Federation till 2035. Project.
5. Kirillova A.N. Strategic Potential and Key Factors of the Public Utility Development // Real Estate, Economics, Management. – 2018. №3. P. 12-16.
6. Public Utility and Life Quality in the XXI Century: Economic Models, New Technologies and Management Practices: Monography / Y.P. Silin, G.V. Astratova, etc.; ed. by Y.P. Silin, G.V. Astratova. – Moscow, Ekaterinburg: Naukovedenie Publishing Center, 2017. – 600 p.

7. Power saving technologies of MRD: from state to a separate apartment [Electronic resource]. URL – <https://www.gkh.ru/article/102272-energoberegayushchie-tehnologii-mkd> (date of address 20.07.2021).

8. Interstate standard GOST 13109-97 «Electric Power. Electromagnetic Compatibility of Technical Facilities. Quality Norms of the Electric Power in General Purpose Power Supply Systems» (implemented by the decree of the Gosstandard of the RF of August 28 1998 № 338).

9. Larin S.N., Khroustalev E.U. Upgrading of the Public Utility Quality as the Main Target of the Comprehensive Modernization of the Public Utility // Multitopic Scientific Electronic Magazine KubGAU [Electronic resource]. – Krasnodar: KubGAU, 2017. – №02(126). URL – <http://ej.kubagro.ru/2017/02/pdf/06.pdf>. – IDA [article ID]: 1261702006. <http://dx.doi.org/10.21515/1990-4665-126-006> (date of address 20.07.2021).

10. Interstate standard GOST 32144-2013 «Quality Norms of the Electric Power in General Purpose Power Supply Systems» (implemented by the Order of the Federal Agency for Technical Regulation and Metrology of July 22 2013. № 400-CT).

11. Interstate standard GOST 33073-2014 «Control and Monitoring of the Electric Power Quality in General Purpose Electric Power Systems » (implemented by the Order of the Federal Agency for Technical Regulation and Metrology of December 8 2014 № 1948-CT).