

ANALYSIS OF INTERNATIONAL EXPERIENCE RELATED TO ENERGY SAVING IN THE FIELD OF COMMUNAL SERVICES

ANALIZA EXPERIENȚEI INTERNAȚIONALE DE ECONOMISIRE A ENERGIEI ÎN DOMENIUL SERVICIILOR COMUNALE

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SUMMARY

The article analyzes the foreign experience in providing energy saving in the sphere of housing and communal services and studies the most effective practices in energy saving of the leading countries of the world. The basic directions of reforms and realization of measures on energy saving in housing and communal services are determined. The attention was focused on the importance of using the innovative thermo-modernization projects of housing stock and alternative energy sources in housing and communal services.

Keywords: *energy saving, foreign experience, tariffs, housing construction, investments, regulation, thermo-modernization.*

REZUMAT

Articolul analizează experiența străină în economia energiei în ceea ce privește locuințele și serviciile comunale și studiază cele mai eficiente practici de economisire a energiei în țările cele mai importante din lume. Sunt determinate direcțiile de bază ale reformelor și realizarea măsurilor de economisire a energiei în serviciile de locuințe și comunale. Atenția s-a concentrat asupra importanței utilizării în locuințe și în serviciile comunale a proiectelor inovatoare de termomodernizare a fondului de locuințe și a surselor alternative de energie.

Cuvinte-cheie: *economie de energie, experiență străină, tarife, construcții de locuințe, investiții, reglementare, termomodernizare.*

Problem statement. Ukraine is undergoing a new historical stage of development, which is directly related to the course of social transformations reflected in the Strategy for

Sustainable Development „Ukraine 2020” (the Strategy). The document envisages priority reforms, one of which - „Reform of Housing and communal services.”

The Strategy also suggests the implementation of the Energy Efficiency Program, the Energy Independence Program and the Innovation Development Program, which will provide the country with energy security and the transition to energy efficient and saving use of fuel and energy resources, technologies and equipments. It includes projects with alternative energy sources, and as a result – provision of the population with the high quality housing and communal services and energy cost reduction.

At present, the housing and communal complex is facing the challenging situation where worn-out heat and water supply stations operate with low efficiency and supply through worn-out networks with energy losses that reach 45-60% [1].

According to expert estimates, the total heat energy consumption in the Ukrainian residential sector is 2 to 3 times higher than in the European Union countries. The annual heat loss in the housing and communal services of the country is 60%. The Ministry of Regional Development of Ukraine data suggests that the maximum energy losses were recorded in apartment buildings and make up about 98% of the total housing stock of the country with consumption of 58% of gas and 34% of electricity from total amount [1].

It is important to note that most of the post-Soviet countries have the same problems in housing and communal services as Ukraine, but they addressing these problems constantly, systematically and with definite efficiency. The current problem solution requires the study of foreign experience in the field of state regulation of energy saving. This will enable implementation of high-quality practices adapted to the needs and capabilities of Ukraine, which will contain available mechanisms for co-financing energy efficiency measures, attract investments in thermo-modernization

of residential buildings and in the construction of facilities with zero energy consumption; implement certification of energy efficiency of buildings, energy audit and energy management systems and ensure 100% accounting of gas, electricity, heat and water consumption.

Since energy saving state regulation reform of Ukraine housing and communal services envisages the use of foreign experience, it is advisable to draw attention to the successful practices of the European Union countries in this area.

Analysis of recent research. The research examined accessible and public information materials on these issues, and first and foremost, under adaptation of their management and regulatory mechanisms to the domestic operation terms of housing and communal services. Nowadays, housing and communal services condition is considered to be „health indicator” of the nation and the economy, as well as public liability factor for the situation in the country, as the housing and communal services issues are socially significant and affect the entire population of any country.

Worldwide scientific practice has formed a sufficiently significant and qualitative resource to understand the issues of housing and communal services and methods of their solution, which should become a solid foundation for further scientific research.

The well-known local and foreign scientists contributed to the research. Among them, there are P. Porter, M. Macierowicz, P. Stevenson, S. Ternoï, R. Kaplan, S. Bushuiev, V. Zhovtianskyi, N. Mkhitarian, Y. Rak, O. Stoliarov, A. Prakhovnyk, O. Samaryn, B. Sanniv, N. Luman, B. Snezhko, A. Mekhalevych, A. Bilokon, I. Shchokin. Unfortunately, there is an absence of basic location-specific researches of international reforms and energy saving experiences in the information space. Therefore, there is a demand to detail the available information on these matters

and to define the most significant methods of energy saving for their further use for housing and communal services of Ukraine. This task is quite relevant to date, as it may have a positive impact on the development and implementation of energy-saving programme in housing and communal services of Ukraine.

The purpose of the article. To analyze the international experiences of energy saving in housing and communal services, to define international leverage over the implementation of housing and communal services reforms, to determine the principal tasks of energy saving optimization in housing and communal services of Ukraine.

The analysis of international experience in energy saving should be started with the analysis of the EU experience in the establishing of the energy policy framework, strategies and programs for improving energy efficiency and energy saving. According to the International Energy Agency (IEA), the European Union has gained the best energy efficiency results among the entire world community.

It is known that the formation of the unified regulatory and legal framework for energy development and energy efficiency has become an important stage in the development of the EU. The significant part of the energy efficiency work has been carried out at the national, regional and local levels. Whereas, the European Commission encourages member countries to give the priority to energy efficiency while formulating and implementing national energy policy.

The IEA „World Energy Outlook 2016” forecasts that, due to the implementation of energy efficiency policy in the EU, the demand for primary energy will decrease by 15% by 2040, with an economic growth by 55%. The European Union is becoming the region with one of the most energy-saving economies in the world. The IEA states that due to the efficient use of fossil fuels and

the implementation of alternative fuels and energy-efficient technologies in the EU, the demand for oil will decrease by almost 40% by 2040.

In 2010, The European Parliament and the Council of the European Union approved the energy policy main document „Energy 2020. A strategy for competitive, sustainable and secure energy” (the energy strategy). The energy strategy defines the goals in energy and climate change sectors for the period up to 2020: to reduce greenhouse gas emissions by 20%, to increase the share of renewable energy to 20% and to make a 20% improvement in energy efficiency.

The EU heads of state and its members of government adopted the framework „Energy Efficiency and its contribution to energy security and the 2030 Framework for climate and energy policy” (COM(2014) 520, 23.07.2014) presented by the European Commission to the European Parliament and the Council at the summit on 23/24 October 2014. The European Council adopted the EU climate and energy policy framework and agreed on increasing the share of renewable energy in EU energy mix to 27% by 2030. The EC also set the goal to increase the energy efficiency level by 27% by 2030, which significantly exceeds the indicators, previously established by the 2020 EU Energy strategy. The European Commission (EC) has fundamentally reviewed energy efficiency challenges and, according to the recommendations of the IEA, it was deemed necessary to consider this area of activity an independent source of energy based on the introduction of energy efficient technology and energy saving measures.

EC and The EU's member governments has determined the priority of the policy of improving energy efficiency in the housing sector. Buildings consume more than 40% of EU's primary energy. Almost two-thirds of this energy is consumed by the residential

buildings and one third by non-residential buildings. Two-thirds of the energy consumed by a building is necessary for the operation of heating, ventilation and air-conditioning systems. According to the calculations of the European Commission, if the cost efficient measures are implemented, the total building energy consumption can be reduced by 30 % [3].

In order to achieve this and implementation of the strategy "Energy 2020. The strategy of competitive, sustainable and safe energy", the Directive 2010/31/EU (Energy Performance of Buildings Directive or EPBD) was adopted, the regulations of which became the requirements of energy efficiency of the buildings.

The main goal of the EPBD is to ensure the creation of the foundation for improving the energy efficiency on the national level targeting residential and public buildings while also determining the number of quantitative indicators of energy consumption and energy efficiency for newly constructed buildings, existing buildings, engineering systems of buildings, and building materials and units. The Directive provides for the need to obtain an energy performance certificate (EPC) for any given building. The residential buildings' EPC information must be public. It is enacted that the Directive must be implemented by all EU member states by 2020. The Directive is based on the requirements of the CEN standards, which increases the role of European standards in the national law practice of each EU Member State.

A number of additional requirements has been adopted in the final formulation of the document at the suggestion of the European Parliament:

- Each EU Member State must develop and implement appropriate energy efficiency measures and establish an independent quality control system in the construction sector, taking into account

national features and economic possibilities.

- Target values and indicators of national energy efficiency requirements must be determined taking into account the structure of primary energy consumption ($\text{kWh} \times \text{year} / \text{m}^2$) or alternative energy consumption indicators.

- During the reconstruction of existing buildings, energy efficiency measures must be used and, if possible, using technology based on the EDP;

- To develop and implement special requirements of energy efficiency of heating, ventilation and air-conditioning systems.

- Starting 2020, all new buildings must satisfy the „zero energy” building requirements (2022 for residential buildings.). The definition of “zero energy” is unique to every EU member state.

- Each premise must have an energy performance certificate with the visible actual value and the plan of the premise's energy efficiency improvement. [4]

Today the harmonization of the standards has the most important place in the standardization and certification systems. The basis of standards, made by European Committee for Standardization (EN), adopts the standards of the International Electrotechnical Commission (IEC) or International Organization for Standardization (ISO) without any changes or with insignificant changes, in which case double abbreviation is used i.e. EN ISO.

The study conducted by the experts in the European Union showed that on a scale of the national economy the overall effect from working with standardization on the basis of using the harmonized standards of ISO, IEC and the European standards exceeds 1% of the overall GDP. The EU companies experience shows (according to the data of Association of Engineers of ABOK, which was established in 1991 by the representatives of Lithuania, Estonia, Ukraine, Latvia, Azerbaijan, Belarus, Russia, Georgia,

etc., and is a member of REHVA and associate member of ASHRAE) that according to the standard investments in the economic development into 1 euro give up to 20 Euros profit. In particular, Germany receives 18 billion Euros annual economic profit by using standardization.

Now the EU member-states are increasing the requirements for standards of specific energy consumption in the new buildings.

It's not necessarily for these buildings to reduce their energy consumption, but the energy flow from external and electric heating should be reduced by improving thermal insulation, heat recovery, generating energy (using solar panels, thermal collectors, heat pumps, wind turbines) and direct solar heating. Today the EU is not allowed to construct the projects consuming more than 60 kW·h/m² per year („a low-energy house” standard). Beginning with 2019 the allowed maximum of energy consumption of one building will make 15 kW·h/m² per year („passive house” standard). [5]

With adoption of EPBD the process of calculating the energy efficiency of buildings is mandatory in EU member states. Calculating energy efficiency of buildings and verifying compliance with requirements is compulsory for the designer at the design stage. The passport of each European building indicates the standard of energy consumption it meets.

In Austria, Germany, Belgium, Greece and Spain only the experts who have the appropriate license are allowed to calculate energy efficiency of buildings. In Denmark, Portugal, Sweden and Ireland the results of calculations are presented as the annual volume of the final energy consumption, while in Germany, France, Holland, Greece they are presented as annual volume of the primary energy consumption. Spain and Finland provide the results using the heat transmission coefficient of different structural elements, while Norway provides the

calculation of energy consumption and heat transmission coefficient as well.

Energy efficiency standards of buildings are getting reinforced through control demands which can result in sanctions if requirements are not met. German passive houses comply with the standard for energy efficiency of annual energy consumption between 30 and 70 kW·h/m².

An interesting experience comes from Switzerland, where passive houses are built to MINERGIE-P standards. This standard means that energy efficiency index for heating, hot water and ventilation must not exceed 38 kW·h/m² in a year, primary energy consumption cannot go higher than 90% over the domestic minimum, and the usage of controlled ventilation with heat recovery is compulsory.

France has applied the standard of „passive” housing construction since 2012, while year 2020 will witness housing standard of „energy plus” where buildings will produce energy more rather than consume it. This country allowed owners of such energy efficient houses not to pay property taxes from 5 to 10 years. Ireland introduced the standard of „passive” houses in 2013 while Finland established it in 2015. Denmark has an obligation towards reduction of specific energy consumption by 75% in new buildings till 2020.

There are no regulatory legal acts towards „passive” houses in Ukraine, but such houses are generally regarded as „passive” ones if their energy-consumption is not higher than 40 kW·year/m², whereas nowadays the ordinary houses in the country consume at least 120 kW·year/m² (150 - 260 kW·year/m², on average).

The cost of buildings with low energy consumption will be much more rational than those with high energy consumption.

In Europe, building costs of an energy-efficient house increase by only 5% and they pay off after only 7 to 10 years of oper-

ating. Nevertheless, project characteristics of low energy consumption buildings allow for the additional pre-investments with refund through significantly cutting down on utility charges.

The implementation of design standards for energy-efficient buildings is essential not only in Northern Europe but also in the countries with warmer climate where the additional construction expenses are compensated with reducing air conditioning energy consumption.

Economic analysis carried out within the framework of the Passiv-on Project clearly demonstrated that the payback periods of energy-efficient building projects are shorter in the warm countries than in the cold ones so the implementation of design standards for energy-efficient buildings is relevant all over Europe.

Thus, the experience of a number of the EU countries shows that only a comprehensive thermal modernization of the existing housing stock can fundamentally affect the reduction of energy consumption. The EU Member States use the legislative provision of energy labelling and eco-design to introduce a set of measures to increase energy efficiency, which will help consumers make an informed choice about more economical mode of energy consumption. Eco-design is a new concept in the EU countries aimed at reducing energy consumption when using products such as domestic electric appliances, gas installations, solid fuel boilers and other products. The energy saving potential within the framework of Directive 2010/30 / EU is estimated at 28%.

Summary. To sum up, it should be mentioned that all the countries facing significant progress on energy efficiency issues give the nation a crucial role to play. Fundamental projects for energy saving in the housing stock are mainly financed from the budget and different specialized funds. Obviously, there is a strong regulatory and le-

gal framework, which governs the relations in the sector and makes the application of energy efficiency requirements obligatory at the design stage.

One of the key aspects for the widespread implementation of the energy saving methods is the high utilities rates. Here, even the slightest bit of saving gives a tangible economic benefit for the consumers.

It is useful to create the levers of influence on consumers for violating the energy saving requirements. The strengthened role of the state in the energy efficiency management should influence not only the legislation but also financing of the large-scale projects for energy saving. Other countries implement various economic incentives, such as reduced taxes, preferential interest rates on loans and also reduced utility rates, as the energy efficiency requirements are fulfilled. There is also a tax reduction for those who implement energy saving methods and achieve certain energy efficiency indicators. Such mechanisms can be used in Ukraine as well.

The implementation of the methods of energy saving and energy efficiency improving should be based on more than 40 years of overseas experience, with adapting it to the national conditions. The policy of energy efficiency cannot be pursued unless the owners of residential premises are interested; therefore, one of the priority measures should be informational and educational work among the population about the energy saving necessity. The lack of motivation constrains energy saving to a large extent.

The researches have shown that the advanced nations not only attach great importance to the energy saving in the housing and communal services, but also carry out the measures for the practical exercising of innovative programs and projects in this field on the large scale and with the permanent state influence.

The article features the examples of definite projects of the EU countries and their results. International experts say the most credible ways to save energy are financial and economic regulations and such incentives as prices and rates, preferential taxation, state financing. The leading role in energy saving also belongs to professional power management that implements international requirements creatively.

Guided by the overseas strategy of using innovative technology in energy saving projects, we cannot but mention that a crucial place is taken by its innovative part, which is also confirmed by investigations of energy saving in Ukraine, including its housing stock. It also says that development rates of housing and utilities infrastructure, and house building, and reconstruction are quite low. The main reason is scarce funding of enterprise, low paying capacity of users of housing services and reform blunders.

That is why it is reasonable to consider international experience. This experience will help to develop the basic tools in the field of energy saving as well as energy efficiency of housing and communal services in Ukraine. We need to adopt EU directives on energy saving, use innovative technologies for energy saving and alternative energy sources. These factors can be used to achieve more efficiency in the housing sector.

Ukraine is going through a new stage of community changes. Its goal is to provide better housing and communal services, cut the energy consumption down. The urgency of the matter has some reasons. Among them are heat and water stations low effi-

ciency, old supply networks. To solve the issue we should study the international government experience in energy saving. It will give an opportunity to implement projects adopted to Ukrainian needs. The post-Soviet countries experience has not got a top priority, because they are facing the same problem and could not solve it once and for all. But the fundamental and purpose-oriented researches about reforms experience and EU's energy-saving are not represented in the wide information space at present. The article's aim is to analyze and determine the basic leverage on the housing and communal services during the reform implementation and the main ways of the energy-saving optimization, which can be used in Ukraine. Not only the analysis of international agreements in the EU countries legal framework, which denotes the global perspectives of sustainable development, was used, but also statistical data, which demonstrates the progress of different energy-efficiency programmes influence on the living standards, environmental condition and national economy.

As EU countries' regulatory acts are compared with the housing and communal services legislation of Ukraine, we can define the main defects in state regulation, which prevent the effective reforms implementation.

Studying the experience of different mechanisms implementation in housing and communal services state regulation and energy-efficiency in the EU countries leads to the definition of the main ways to improve the investment potential in Ukraine and the innovative technology introduction.

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