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Voznyuk M.
Doctor of Economics, Professor,
Professor of Financial Consulting and Banking Department,
Educational and Scientific Institute of Economic and Social Relations,
Banking University, Lviv, Ukraine;
e-mail: ma.voznyuk@gmail.com; ORCID ID: 0000-0001-7393-9850
Pankiv O.
Ph. D. student,
Banking University, Lviv, Ukraine;
e-mail: opankiv2021@gmail.com; ORCID ID: 0000-0001-9657-2668
Bohiv R.
Ph. D. student,
Banking University, Lviv, Ukraine;
e-mail: reb_@ukr.net; ORCID 0000-0001-6981-9215

FEATURES OF THE INVESTMENT SOURCES ATTRACTING IN THE ENERGY SAVING INFRASTRUCTURE OF UKRAINE

Abstract. The peculiarities of the investment sources attracting in the energy saving infrastructure of Ukraine are illuminated. The energy saving infrastructure is proposed to be considered in terms of its elements, such as macro-, meso- and micro-level institutions together with the implemented measures. It is proposed to include world, international and European organizations (such as the Energy Community, World Bank, EBRD, NEFCO, etc.) into the macro-level institutions, which together with meso- and micro-level institutions implement programs and strategies to optimize the irrational use of energy resources. Meso-level institutions include state agencies, ministries, the Cabinet of Ministers, the Verkhovna Rada, the President of Ukraine, large financial institutions, and others. The micro-level institutions are presented by the village, settlement, city councils and their executive bodies; district and regional councils, which represent common interests of territorial communities of villages, settlements and cities; district councils in cities and their executive bodies.

In order to improve the forms and methods of attracting sources of investment in energy saving infrastructure, it is necessary to conduct a thorough analysis of the existing measures and programs implemented in the country today. The study of implemented projects, strategies and programs allowed to identify the strengths and weaknesses of each event, as well as areas that need further elaboration.

Conclusions are drawn that the investment potential of Ukraine's energy saving is extremely high and includes measures of various nature, namely: from targeted allocation of funds for the renewal of fixed assets of institutions to educational activities, promotion of measures for the rational use of resources. Also, since the sources of investment are quite widely diversified geographically, it can be argued that the issue of domestic energy conservation is relevant in the global and international arena.

Keywords: energy saving, investment, energy saving infrastructure, energy efficiency, Energy Community, World Bank, European Bank for Reconstruction and Development.

JEL Classification Q40, Q49, G24

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Вознюк М. А.
доктор економічних наук, професор,
професор кафедри фінансового консалтингу та банківництва,
Навчально-науковий інститут економічних та соціальних відносин
Університету банківської справи, Львів, Україна;
e-mail: ma.voznyuk@gmail.com; ORCID ID: 0000-0001-7393-9850

Паньків О. Р.
аспірант
Університету банківської справи, Львів, Україна;
e-mail: opankiv2021@gmail.com; ORCID ID: 0000-0001-9657-2668
Богів Р. Є.
аспірант
Університету банківської справи, Львів, Україна;
e-mail: reb_@ukr.net; ORCID ID: 0000-0001-6981-9215

ОСОБЛИВОСТІ ЗАЛУЧЕННЯ ДЖЕРЕЛ ІНВЕСТУВАННЯ В ІНФРАСТРУКТУРУ ЕНЕРГОЗБЕРЕЖЕННЯ УКРАЇНИ

Анотація. Розглянуто особливості залучення джерел інвестування в інфраструктуру енергозбереження України. Запропоновано розглядати інфраструктуру енергозбереження в розрізі таких її елементів, як інституції макро-, мезо- та мікрорівня разом з імплементованими заходами. До інституцій макрорівня запропоновано відносити світові, міжнародні та європейські організації (такі як Енергетичне Співтовариство, Світовий банк, ЄБРР, НЕФКО та ін.), що спільно з інституціями мезо- та мікрорівня впроваджують та реалізовують програми і стратегії задля оптимізації нераціонального використання енергетичних ресурсів. До інституцій мезорівня — державні агенства, міністерства, Кабінет Міністрів, Верховну Раду, Президента України, великі фінансові установи та інші до інституцій мікрорівня — сільські, селищні, міські ради та їхні виконавчі органи; районні та обласні ради, що представляють спільні інтереси територіальних громад сіл, селищ і міст; районні в містах ради та їхні виконавчі органи.

Для вдосконалення форм і методів залучення джерел інвестування в інфраструктуру енергозбереження необхідним є проведення ґрунтовного аналізу щодо наявних заходів і програм, які здійснюються у країні сьогодні. Проведене дослідження імплементованих проєктів, стратегій і програм дало змогу визначити сильні та слабкі сторони кожного заходу, а також ділянки, що потребують подальшого доопрацювання.

Зроблено висновки про те, що інвестиційний потенціал енергозбереження України є надзвичайно високим і передбачає заходи різноманітного характеру, а саме: від цільового направлення коштів для оновлення основних засобів установ до освітньої та просвітницької діяльності, пропагування заходів щодо раціонального використання ресурсів. Також, оскільки джерела інвестицій є досить широкодиверсифіковані географічно, можна стверджувати, що питання вітчизняного енергозбереження є актуальним на світовій і міжнародній арені.

***Ключові слова*:** енергозбереження, інвестування, інфраструктура енергозбереження, енергоефективність, Енергетичне Співтовариство, Світовий банк, Європейський банк реконструкції та розвитку.

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Introduction. The concept of energy saving is not something far and distant from our daily lives, but only arose in response to the growing urgent need to reduce and optimize the irrational use of energy resources. Energy saving in Ukraine is not only a set of institutions, not only the main or additional sectors of the economy that contribute to the achievement of energy efficiency goals. It is a whole system of interconnected elements that has historically developed and evolved, which includes institutions of different levels, tools that are constantly updated, activities and goals that are constantly reviewed and monitored, as well as ongoing legislative support at all levels for rational energy use.

Research analysis and problem statement. The evolution of theories of rational use of resources is historically due to such factors as: limited most of the raw materials of countries; intensification of competition for resources at domestic and foreign levels; increasing risks of environmental disasters; low efficiency of resource management; the emergence of international

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conflicts caused by the global redistribution of influence and rights, etc. These issues served as the basis of scientific research P. Samuelson [1, p. 29], T. Malthus, J. Pfeffer and G. Salanyk [2].

An active energy saving policy came to Ukraine in the mid-1990s, almost 20 years after it became an important element of state policy in developed countries. A number of authors have studied this issue [3—6]. However, as a result of the processes of globalization and opening of borders, the issue of cooperation with international institutions and funds in energy saving issues arises. Therefore, in-depth analysis and monitoring of existing international support programs, research of the work done and identification of positive results and errors to understand the further direction of the movement is becoming increasingly important.

Methodology and research methods. The methodological basis of the study is a systematic approach, which is based on the use of the main provisions of the theory of energy saving and energy efficiency. The following research methods are used in the article:

- theoretical generalization and systematization (to determine the features of attracting sources of investment in energy saving infrastructure in terms of its elements);
- comparison (in the study of existing approaches to attracting sources of investment in terms of institutions at different levels);
- system analysis (in determining the characteristics and results of the implementation of various programs by both international organizations and domestic institutions).

Research results. The investment attracting in each sector of the economy has its own characteristics and state priorities. However, the energy sector and energy resources are critical for the life quality improving and empowering the country. The peculiarity of attracting investments in the energy sector of Ukraine is the recognition of its priority at the legislative level. And the issue of improving the energy efficiency of all EU member states is recognized as relevant by a large number of international documents.

Table 1 presents the features of investment sources attracting in the energy saving infrastructure in terms of its elements, such as institutions of different levels and specific investment measures.

The Energy Community is an international organization in which the members of the European Union and its neighbors participate. The organization aims to expand the EU energy market. Participating countries are committing themselves to energy, creating a regulatory framework and liberalizing their energy markets [7]. Ukraine acquired the status of a Contracting Party in the Energy Community of South-Eastern Europe in 2011. Ukraine's accession to the Treaty establishing the Energy Community will contribute to the establishment of long-term financial stability of the energy sector and improve the investment climate in Ukraine, will stimulate the introduction of energy-saving technologies [8].

According to the *World Bank* (WB), the municipal utility sector in Ukraine has been suffering from underinvestment and inadequate maintenance for several decades. Ukraine's energy efficiency is one of the lowest in the region. To solve this problem in a way that will ensure stable energy savings, the World Bank provides financial support using a credit line. Thus, on June 10, 2011 PJSC Ukreximbank and the World Bank signed a Loan Agreement and a corresponding Guarantee Agreement. With this, they launched the Energy Efficiency Project with a loan of $ 200 million. The objectives of the Project were: to assist selected private banks in expanding their energy efficiency activities in the industrial and municipal sectors; providing financing for investments that increase energy efficiency in industrial and municipal enterprises. This program provides a maximum amount for projects — $30 million, with a maximum term of 10 years [9].

Also in November 2014, the World Bank launched a project to increase energy efficiency in the field of district heating, which aims to reduce losses and increase the efficiency of six companies providing district heating services in different regions of Ukraine, namely: «Dniproteploenergo», «Mykolaivoblteploenergo», «Khersonteploenerho», «Kharkiv Heat Networks», «Miskteplovodenerhiya» (Kamyanets-Podilskyi) and «Ternopilmiskteplokomunenerho». Participating companies were working for modernizing fixed assets, which will improve the quality of district heating services while reducing their cost by

increasing efficiency in production and reducing losses in heat transportation. Project funding is $272.05 million [10].

The European Bank for Reconstruction and Development (EBRD) is the largest financial investor in Ukraine. According to the Strategy for Activities in Ukraine for the period 2018—2023, the net total investment of the EBRD in Ukraine is 12.6 billion euros, the number of active projects — 169.

Table

Features of the investment sources attracting in the energy saving infrastructure in terms of its elements

<table>
<tr><th rowspan="2">MEASURES</th><th colspan="3">INSTITUTIONS</th></tr>
<tr><th>Macro level</th><th>Meso level</th><th>Micro level</th></tr>
<tr><td>Protocol on the Accession of Ukraine to the Treaty establishing the Energy Community</td><td>The Energy Community</td><td>- President of Ukraine
- Verkhovna Rada of Ukraine</td><td rowspan="15">- village, settlement, city councils and their executive bodies;

- district and regional councils representing the common interests of territorial communities of villages, settlements and cities;

- district councils in cities and their executive bodies</td></tr>
<tr><td>Project «The improving of the energy efficiency in Ukraine»</td><td rowspan="2">World Bank (WB)</td><td>- PJSC «Ukreximbank»
- selected private banks</td></tr>
<tr><td>Project «The improving of the energy efficiency in the district heating sector of Ukraine»</td><td>Ministry of the Communities and Territories Development of Ukraine</td></tr>
<tr><td>The Activity Strategy in Ukraine for the period 2018—2023</td><td rowspan="2">European Bank for Reconstruction and Development (EBRD)</td><td>Cabinet of Ministers of Ukraine</td></tr>
<tr><td>The Energy efficiency program in the public sector of Ukraine</td><td>Ministry of the Communities and Territories Development of Ukraine</td></tr>
<tr><td>More than 516 million euros have been raised for the implementation of 22 energy efficiency projects</td><td>Eastern European Partnership for Energy Efficiency and Environment (E5P)</td><td>Ministry of Energy of Ukraine</td></tr>
<tr><td>The Energy Saving Program</td><td rowspan="3">Northern Environmental Finance Corporation (NEFCO)</td><td rowspan="3">Ministry of the Communities and Territories Development of Ukraine</td></tr>
<tr><td>The DemoUkrainaDH and The DemoUkrainaDH-2 Programmes</td></tr>
<tr><td>The Sweden-Ukraine District Heating Support Program SUDH</td></tr>
<tr><td>Project «The Reform of urban heating in Ukraine»</td><td rowspan="3">United States Agency for International Development (USAID)</td><td>Ministry of the Communities and Territories Development of Ukraine</td></tr>
<tr><td>The Municipal Energy Reform in Ukraine Project</td><td>Ministry of Energy of Ukraine</td></tr>
<tr><td>The Energy Security Project</td><td>Cabinet of Ministers of Ukraine</td></tr>
<tr><td>Project «The Efficient energy consumption in hospitals»</td><td rowspan="3">German Society for International Cooperation (GIZ)</td><td>Ministry of the Communities and Territories Development of Ukraine</td></tr>
<tr><td>Project «The Reforms in the field of energy efficiency in Ukraine»</td><td>- Ministry of the Communities and Territories Development of Ukraine
- State Agency for Energy Efficiency and Energy Saving</td></tr>
<tr><td>Project «The Enterprises Consulting on energy efficiency»</td><td>Ministry of Economic Development, Trade and Agriculture of Ukraine</td></tr>
</table>

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As stated in the EBRD's strategy for Ukraine, the bank will expand and deepen its efforts to achieve strategic priorities in 2018—2023, including strengthening energy security through effective regulation, market liberalization, diversification and increase in production, as well as increasing energy efficiency [11].

In order to improve energy efficiency, the EBRD has reaffirmed its readiness to implement resource efficiency measures in various industries and the built environment, including through financing programs for the transition to a green economy and the Green Cities initiative for municipal projects. It also expressed readiness to increase the participation of the private sector in the provision of energy saving services, including on the basis of contracts with payment for actual results.

In 2017, a €100 million «Energy Efficiency Program in the Public Sector of Ukraine» was approved to provide loans to municipal energy management companies in Ukraine to finance energy saving measures in public buildings and street lighting infrastructure. These investments are expected to significantly increase the energy efficiency of public buildings, and thus conserve energy, reduce greenhouse gas emissions, and increase comfort in kindergartens, schools and hospitals that will be included in subprojects under the Program [12].

The Eastern Europe Energy Efficiency and Environmental Partnership (E5P), or the so-called Swedish Initiative, was set up by international donors to co-finance investments in the Ukrainian utilities sector and the Eastern Partnership countries, with a special focus on to aspects of energy efficiency. The Fund's contributors to E5P are Denmark, Estonia, the European Union, Finland, Iceland, Latvia, Lithuania, Norway, Poland, Sweden, Ukraine and the United States.

E5P funds are provided in addition to energy efficiency loans provided by international financial institutions, including the European Bank for Reconstruction and Development, the European Investment Bank, the Nordic Investment Bank, the Nordic Environmental Finance Corporation and the World Bank Group.

The Fund's activities in Ukraine have been extended until 2029. In the previous phase of E5P, Ukraine's contribution of 10 million euros since 2011 allowed to attract more than 516 million euros for 22 energy efficiency projects, of which 370 million euros — loans from international financial organizations, executors of E5P Fund projects, 107 million euros — directly E5P grants, as well as international technical assistance from other sources and co-financing [13].

The Northern Environmental Finance Corporation (NEFCO) is an international financial organization founded by five Nordic countries (Norway, Iceland, Denmark, Sweden and Finland) in 1990. The corporation supports green growth investments and finances projects mainly in Russia, Ukraine and Belarus [14].

NEFCO has been operating in Ukraine since 2004. The Verkhovna Rada of Ukraine ratified the framework agreement with this international financial organization in 2010.

Direct investment uses various schemes of public and private cooperation, as well as utilities. Preferential loans are provided to enterprises and companies of all forms of ownership, including utilities, which implement projects that meet the priority areas of environmental improvement.

The NEFCO Energy Saving Program is designed exclusively for utility projects (kindergartens, schools, sports facilities, street lighting). The maximum loan amount granted under the program is equivalent to 400 thousand euros in local currency [14].

In addition, NEFCO and the Ministry of Regional Development, Construction and Housing of Ukraine (now the Ministry of the Communities and Territorial Development of Ukraine), with the support of Sweden and the E5P Foundation, created and implemented the financial program Demo Ukraina DH and Demo Ukraina DH-2. The aim of these programs is to demonstrate to Ukrainian cities new technologies and modern solutions that can be applied in district heating systems, together with the use of international practice of project preparation, design, procurement, and control of the results of energy efficient heating services. The program has been operating since 2012 and about 20 projects have been completed or are in the process of implementation.

The Sweden-Ukraine District Heating Support Program SUDH was established by NEFCO and Sweden to support energy efficient district heating in Ukraine to provide quality services with low environmental impact. SUDH offers funding for long-term projects that will have a positive impact on Ukrainian district heating systems. Thanks to this program, the following results were achieved: in Vinnytsia, the heating network and a new biofuel boiler house were combined, in Uman, biofuels were introduced and heat supply was modernized, in Chernivtsi, two thermal districts were combined into one heating system, etc. [15].

The *United States Agency for International Development* (USAID), an independent agency of the US federal government, is responsible for non-military US assistance to other countries. USAID's mission in Ukraine is to support the country's transition to democracy and a market economy, to reduce the negative effects of the transition period for the most vulnerable.

During 2009—2013, USAID, in cooperation with the Ministry of Regional Development, implemented the District Heating Reform in Ukraine Project in Ukraine. The USAID project supported the Government of Ukraine in improving the regulatory framework for implementing the necessary reforms in the district heating sector. In cooperation with 25 partner cities, the Project analyzed the state of district heating systems, assisted in the development of municipal energy plans, regulatory framework and technical specifications of meters, implementation of energy efficient demonstration projects in the heat sector and utilities. In total, this USAID Project has helped cities to raise $ 175 million in public and private funds for energy efficiency projects, including funding from international financial institutions, state and municipal budgets, commercial banks, and private partners [16].

During 2013—2017, USAID implemented the Municipal Energy Reform in Ukraine project. The budget for a four-year project to improve energy security in 17 cities by promoting international financial institutions and private investors was $ 13.5 million. In Ukraine, the project was implemented by the American company International Resources Group with its international and local partners. The USAID Municipal Energy Reform in Ukraine project aimed to reduce greenhouse gas emissions and increase Ukraine's energy security by improving energy policy, increasing energy efficiency, and attracting private investment in the energy sector. Under the Project, 17 cities in Ukraine received technical assistance in developing Sustainable Energy Development Plans (SEAPs), which also included emission reductions and the replacement of part of natural gas consumption with alternative and renewable energy sources [17].

During 2018-2023, the implementation of the Energy Security project will continue. The main task of the project is to assist in the creation and development of free market mechanisms in the energy sector. The Energy Security Project will assist the Government of Ukraine in ensuring a reliable, sustainable and secure energy supply for citizens at an affordable level, its integration into European energy markets by assisting key institutions and the energy sector regulator in complying with EU legislation and improving energy security and energy saving, through the creation of competitive markets in electricity, natural gas and heat supply, as well as in increasing the availability of available energy resources by supporting private investment in the development and greater use of renewable energy sources.

The *German Society for International Cooperation* (Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ) is a federal institution that supports the German Government in achieving its goals in the field of international cooperation for sustainable development. The company operates in more than 130 countries and has 16,410 employees, 70% of whom are national employees [18].

Since 1993, GIZ has supported reform processes in Ukraine through the provision of advisory and consultancy services and the organization of training events. Most of the activities in Ukraine are carried out at the request of the Federal Ministry for Economic Cooperation and Development of Germany. The legal basis for GIZ's activities in Ukraine is determined by the terms of a framework agreement concluded by the Governments of Ukraine and Germany in 1996. Representatives of both governments meet regularly to identify priority areas for cooperation and measures for mutual development. To date, the priority areas are:

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- democracy, civil society, public administration, regional development and decentralization;
- energy;
- sustainable economic development.

In early 2014, the implementation of the project «Establishment of energy agencies in Ukraine» began as part of the International Initiative for Climate Protection of the Federal Ministry of Environment, Nature Protection and Safety of Nuclear Reactors of Germany. The main goal of the project was to create energy agencies and provide advice to citizens and other customers, which has mastered the potential for energy conservation, increased energy efficiency and, consequently, reducing greenhouse gas emissions.

During 2016—2019, GIZ together with the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine implemented the project «Efficient energy consumption in hospitals». As part of the project, energy efficiency measures were carried out in 17 city hospitals in the partner cities of Sumy and Chernihiv. About 26 thousand patients are hospitalized here annually. With the support of GIZ, all these hospitals conducted energy audits according to the European standard EN 16247-1. In total, 87 audit reports formed strategic and priority measures for more efficient energy consumption. With an initial investment cost of almost € 14 million, the implementation of these measures will save around € 1 million per year [19].

During 2017—2020, together with the Ministry of Development of Communities and Territories of Ukraine and the State Agency for Energy Efficiency and Energy Saving, the project «Reforms in the field of energy efficiency in Ukraine» was implemented. Among the results of the project implementation are the following:

- with the support of the project, 10 documents were developed at the request of the project partners (Ministry of Regional Development and the State Agency for Energy Efficiency);
- under the auspices of the Ministry of Regional Development and the State Agency for Energy Efficiency, two sub-processes of energy efficiency reform were systemated and coordinated. In particular, they include certain requirements of EU directives that must be implemented in national legislation in accordance with the Association Agreement;
- with the participation of the Ministry of Regional Development and the State Agency for Energy Efficiency, four seminars, trainings and conferences were held to enhance the professional competencies of other institutions which are involved in policy development and decision-making or consultation on energy efficiency reform;
- two documents were presented to The Ministry of Education which contain a description of the necessary qualifications for work in the energy efficiency sector and which were developed jointly with educational institutions (universities, vocational education institutions);
- Energy innovation centers were developed with the support of the project and estimated by 80 percent of representatives of vocational schools, universities and the private sector as useful for training and retraining [20].

The project «Consulting of enterprises on energy efficiency» together with the Ministry of Economic Development, Trade and Agriculture of Ukraine was implemented in 2017—2021.

Nearly 100 companies received support from the expert project in identifying, planning and implementing energy efficiency measures. Energy audits were conducted for 69 companies and measures were proposed to save a total of about 85 GWh of energy. In order for these companies to be able to immediately implement measures that require little or no investment, their specialists received practical training in energy efficiency. Thus, about 400 employees of enterprises (specialists and managers) gained knowledge on energy-efficient application of standard technologies, such as lighting, compressed air, steam boilers, etc.

Three energy efficiency training networks (LEENs) have been set up. Through them, participants received support in the implementation and monitoring of energy efficiency measures and share experiences. In addition, they agreed on common energy efficiency goals. The two networks have already signed their commitments: by the end of 2020, the 24 companies involved want to save 10,500 MWh of energy and reduce emissions by 61,010 tons.

The Kyiv Chamber of Commerce and Industry received support in the implementation of the European Energy Manager (EUREM) qualification program in Ukraine. 52 students from enterprises and service companies successfully passed this course and received international certificates [18].

Conclusions. Thus, based on the above, it can be argued that the investment potential of energy saving in Ukraine is extremely high and involves various measures: from targeted funding for the renewal of fixed assets of institutions to educational activities, promotion of resource management. Also, sources of investment are quite widely diversified geographically. Thus, both international financial institutions and European funds invest in energy saving infrastructure, and the country's budget funds are allocated.

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