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ENERGY EFFICIENCY OF UKRAINIAN ECONOMY: PROBLEMS AND PROSPECTS OF ACHIEVEMENT WITH THE HELP OF ESCOs *

The paper grounds the prerequisites, the role and the benefits of energy service company (ESCO) in increasing energy efficiency of national economy. There author investigates the dynamics of domestic energy efficiency market and the problems impeding ESCO development today. The economic mechanisms of government support for ESCO in Ukraine and the directions of solving problems and the mechanisms of energy service activation at various levels of management are analyzed.

Keywords: energy efficiency; energy service companies; economic instruments; government support.

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ЕНЕРГОЕФЕКТИВНІСТЬ ЕКОНОМІКИ УКРАЇНИ: ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ ДОСЯГНЕННЯ ЗА РАХУНОК ЕСКО

У статті обґрунтовано передумови, роль та переваги енергосервісної компанії (ЕСКО) в зростанні енергоефективності національної економіки. Досліджено динаміку вітчизняного ринку енергоефективності, а також проблеми, що перешкоджають діяльності ЕСКО на сучасному етапі. Проаналізовано економічні механізми державної підтримки ЕСКО в Україні та визначено напрями вирішення проблемних питань і механізмів активізації енергосервісної діяльності на різних рівнях господарювання.

Ключові слова: енергоефективність; енергосервісна компанія; економічні механізми; державна підтримка.

Рис. 2. Табл. 1. Літ. 16.

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ЭНЕРГОЭФФЕКТИВНОСТЬ ЭКОНОМИКИ УКРАИНЫ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ ДОСТИЖЕНИЯ ЗА СЧЕТ ЭСКО

В статье обоснованы предпосылки, роль и преимущества энергосервисной компании (ЭСКО) для роста энергоэффективности национальной экономики. Исследованы динамика отечественного рынка энергоэффективности, а также проблемы, препятствующие деятельности ЭСКО на современном этапе. Проанализированы экономические механизмы государственной поддержки ЭСКО в Украине и определены направления решения проблемных вопросов и механизмов активизации энергосервисной деятельности на различных уровнях хозяйствования.

Ключевые слова: энергоэффективность; энергосервисная компания; экономические механизмы; государственная поддержка.

Problem setting. Energy efficiency (EE) remain relevant for Ukrainian economy throughout all the years of country's independence. Recent deep economic and energy crisis significantly exacerbates this issue. Dependence of the country on Russian gas imports against the backdrop of high energy intensity of GDP and military conflict on Ukrainian East turn the mechanisms for increasing EE into the means of economic and political survival of our nation. A significant bonus of implementing these mechanisms is the possibility to stabilize the environmental situation in the country as well.

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Recent research and publications analysis. The problems of EE development within socioeconomic systems have been investigated by many foreign (Bertoldi et al., 2014; Scheuer et al., 2013; Weiss et al., 2014) and Ukrainian scientists (Shevtsov et al., 2014; Stepanenko, 2012). Over viewing the existing scientific achievements in the field it should be noted that the current economic crisis and political instability in Ukraine actualize the issue of developing appropriate mechanisms to ensure EE growth within national production and consumption. An important problem remains the imperfection of the institutional framework for the implementation of domestic EE projects, in particular, insufficient development of network to implement such projects on the "turn-key basis" (starting from finding sources of EE increase and completing the installation and running up the energy saving (ES) equipment including full financial support of projects). In our opinion, the key to solving this problem is the development of energy service companies (ESCOs), which might form the basis for the implementation of EE measures at the microlevel.

So, **the aim of the research** is the investigation of prerequisites, features and problems of the ESCOs sector development within Ukrainian economy in order to increase its EE and the identification of promising directions for problem solving and appropriate mechanisms for their implementation. The research objectives are:

- justification of prerequisites, the role and benefits of ESCOs in increasing the EE of the national economy;
- analysis of the dynamics of the domestic EE market and of the problems impeding ESCOs development at the present stage;
- analysis of economic mechanisms for ESCOs government support in Ukraine;
- formation of directions for solving problems and mechanisms of energy service activities development at various levels of management.

Key research findings. The energy intensity of GDP has remained traditionally high for Ukraine throughout the history of its independence. In 2013 this indicator was 339 koe/USD (PPP, 2005), or 2.12 times higher than the world average and 2.95 times higher than in the EU (EE Indicators, 2015). The energy intensity of Ukrainian economy is also much higher as compared to some regions in Asia and the CIS countries. At the same time, as high energy intensity determines the huge potential for EE growth within production and consumption processes in Ukraine, only a small part of which is now implemented. Industries, residential property, utilities and the power sector have the lowest energy ratings and therefore the largest potential for increased EE. According to the data from (EE Indicators, 2015) and the average EU indicators, in 2013 the possibility for reducing energy consumption through EE improvements was about 234% of the current level in domestic industries, 94% – in the service sector, 24% – for transport and 32% – for electric power industry. Housing sector also has a high potential for ES (more than 30% from the current level of energy consumption), using about 40% of the total consumption of electricity and natural gas in the country. According to (Shevtsov et al., 2014), the heating of 1 m² of housing in Ukraine consumes 2–2.5 times more gas than in European countries. The mentioned sectors of our economy should be the priority in the implementation of EE measures.

Government of Ukraine adopted the updated Energy Strategy of Ukraine till 2030, State Target Economic Program on Energy Efficiency and the Development of

Energy Production from Renewable Energy Sources and Alternative Fuels for 2010-2015, National Renewable Energy Action Plan by 2020 and other laws. However, the processes of EE improvements in the economy are extremely slow. Imperfect legal basis, low energy prices till recently, lack of information for energy consumers concerning EE opportunities, lack of reliable funding and professional performers for EE projects have been the main reasons for this deceleration. Stimulation of ES market development and involvement of its key players – ESCOs – in the processes of EE growth can be a powerful tool in developing the ES potential of Ukraine and its regions.

By definition of the EU EE Directive (2012/27/EU) ESCO is "a company that offers energy services which should include implementing EE projects (and other sustainable energy projects). Many ESCOs work on a turn-key basis" (Scheuer et al., 2013). The main characteristics of ESCO are the following: 1) ESCOs guarantee energy savings and/or provision of the same level of energy service at lower costs. This is referred to as a performance guarantee, which can take several forms (revolve around the actual flow of energy savings from a project, stipulate that energy savings will be sufficient to repay monthly debt service costs, the same level of energy service is provided for less money); 2) the remuneration of ESCOs is directly tied to the energy savings achieved; 3) ESCOs can finance or assist in arranging financing for the operation of an energy system by providing a savings guarantee. Therefore ESCOs accept some degree of risk for the achievement of improved EE in a user’s facility and have their payment for the services delivered based (either in whole or at least in part) on the achievement of those EE improvements (Bertoldi et al., 2014). The main advantages of ESCO participation in EE increasing are not limited to the scope of ESCO and its customers, but also include other economic entities: local and state authorities, population of a certain territory, business etc. (Figure 1).

<p style="text-align: center;">Property owner (client)</p> <ul style="list-style-type: none"> - Energy cost savings (or other utility cost) - No or low upfront cost - Healthier indoor environment - Increase of comfort - Building value increase - Additional renovation components (aesthetics, status improvement, extension etc.) - Public image/prestige 	<p style="text-align: center;">ESCO/contractor</p> <ul style="list-style-type: none"> - Workplace - Profit - Long-term reliable partnership - Possibly further contracts with the same partner - Public image/prestige
<p style="text-align: center;">Municipality/community</p> <ul style="list-style-type: none"> - Jobs - Growth of the value of the building stock and more attractive district/area - More attractive district/area for investments - Healthier district - Independency - Development of communities - Healthier environment 	<p style="text-align: center;">National economy</p> <ul style="list-style-type: none"> - Jobs - Development of real estate market – growth of GDP - Motivation of residents’ and/or investors to spend money locally - Growth of energy security, decrease of the need for energy resources - Healthier environment

Figure 1. Benefits of ESCO projects for stakeholders, improved by the author on the basis of (Bertoldi et al., 2014)

ESCOs also have a number of advantages over other companies that provide energy services. Financial mechanisms used by ESCOs are more effective than traditional contracts. Ordinary schemes of ES services provision (supply and installation of ES equipment, energy audit, training on EE issues, energy management etc.) do not include sharing the financial risk of EE project between customer and contractor. Thus, contractor is not interested in maximizing the effects of a project. The use of Energy Service Contracts by ESCOs (in the interpretation of (Law of Ukraine, 9.04.2015, # 327-VII), enables customers save their own funds and implement highly effective ES measures even under conditions of financial deficits without attracting credit resources.

In Ukraine today there are about 30 large and 70 small ESCOs. Most of them work in various industries and the housing sector. In 2001–2013 around 100 EE projects were realized in residential and public real estate (Bertoldi et al., 2014; Stepanenko, 2012). The peculiarity of domestic ESCOs is the implementation of large-scale projects, mainly at the expense of the government or/and with the help of grants provided by international donor organizations (UNDP, USAID and the EU). The reason for this is the fear of potential customers of large-scale EE projects due to high risks. This does not stimulate owners to risk their money, moreover, given the relatively low utility tariffs for population till recently ES projects in the housing sector were characterized by long payback periods (7–15 years).

According to (Bertoldi et al., 2014) the potential size of the ESCOs market in Ukraine is estimated around 100 mln EUR. However, there are no adjusted schemes for implementing and financing EE projects for different categories of customers. There is also a lack of legislation, professional performers and informational support for promoting EE measures etc. The main barriers in 2013 for the development of the ESCO market in Ukraine are outlined in Table 1.

Table 1. Rating of barriers to ESCO activity in 2013 (Bertoldi et al., 2014)

Type of barrier	Rating	Type of barrier	Rating
No ESCO legislation	1	Low awareness about financial solutions	5
Lack of financial solutions	2	Disabling polices, lack of trust	6
Existence of in-house expertise	3	Split incentives	7
High transaction costs	4	Competition with other instruments	8

Given the increase in utility tariffs in 2014–2015, it should be noted the growing recognition of the need for ES and financial feasibility of such measures, willingness to invest in EE among population and business. On the other hand, the current economic crisis has mixed impact on the development of domestic ESCO market and the implementation of EE projects. Unstable financial position of ESCOs customers leads to their frequent rejections of ES measures implementation due to increased financial risks. However, the need for production restructuring, significant reduction of energy costs for enterprises and organizations makes them achieve these goals through energy saving involving ESCOs. But improving the legal principles of ESCOs functioning and financial mechanisms of their work, the formation of multilevel ES funds for financial support of the most effective EE projects implementation on a competitive basis remain problematic.

Today most of EE measures are implemented in the industrial sector of Ukraine and are represented by short- and medium-term projects. The intensity of ES processes in the public sector and in households is much less due to legal, organizational and economic problems. Until recently the current legislative framework had no concept of "energy service" and "energy service contract". It made it impossible to form equal legal relations between ESCOs and customers and to protect the rights of ESCOs in court. The current Budget Code did not provide economic incentives for ES in budget organizations and accumulation of funds for such purposes on the long-term basis.

The situation with related legislation has changed for the better since the Verkhovna Rada of Ukraine adopted two laws (9.04.2015, # 327-VI; 9.04.2015, # 328-VII). They significantly expand the perspectives of medium- and long-term ES in public institutions involving ESCOs through public procurement. These laws also set long-term budgetary obligations under the energy service on the basis of essential terms of energy service contract. Documents are drafted in cooperation with the European Bank for Reconstruction and Development (EBRD) and supported by the World Bank. At the first stage EBRD is ready to allocate 1.5 bln UAH for laws' implementation in Ukraine (Poroshenko, 8.05.2015). Because of their novelty legal schemes are not yet worked out, so it is too early to expect a significant positive impact of the adopted laws on the EE growth. However, while working with public institutions a significant barrier to ESCOs remains – that is high level of corruption in these structures. ESCOs also need to participate in tendering procedures, which are not always transparent. All of these shortcomings make public sector an unwanted client for ESCOs (Sotnyk and Mazin, 2015).

ES potential of domestic households reaches 40% of the total capacity of EE increase. This sector is presented by a plenty of small customers, that makes ESCOs transaction costs on energy service contracts very high and the amount of savings under a contract (and hence the remuneration of ESCO) relatively low. As a rule, the main problems arise when concluding agreements with numerous owners of apartments. Agreement with each owner on the contents of EE measures and especially on costs is extremely difficult. In addition, sometimes it is virtually impossible to determine the owner of certain structural elements of a building in a project. The lack of households' investments for EE projects also does not contribute to people's aspiration to cooperate with ESCOs (Sotnyk and Mazin, 2015). These factors make the households sector unattractive and force ESCOs to look for customers in industries and the public sector, although recent government initiatives designed to encourage ES in the households (Cabinet of Minister of Ukraine, 8.04.2015, # 231) have to change attitudes of ESCO and the public to these issues.

Given the recent changes in legislation, systematization of main economic mechanisms of direct and indirect government support of EE and ESCOs market in Ukraine is presented in Figure 2.

It should be noted that the country has positive changes in terms of economic incentives for EE growth. In particular, these are innovations for the public sector and households that make domestic organizational and economic mechanisms of EE growth management closer to European standards. Meanwhile, there is still a lack of information on real ES opportunities; economic entities do not want to take loans with

high interest rates for EE measures; companies and population have no experience in the preparation of applications for EE projects cofinancing etc. In this respect, ESCOs that provide qualified energy services on the turn-key basis and with payment by results are the optimal variant of EE technologies promotion at the domestic market.

<p>Direct government funding of pilot projects: providing funding from budgets of different levels for the implementation of pilot EE projects, including the mechanisms of public and private partnership, joint EE programs of government of Ukraine with other countries (Financing..., 2015)</p>	<p>Incentive tariffs: establishment of special electricity tariffs, including “feed-in” tariff (Law of Ukraine, 19.10.1997, # 575/97-VR)</p>
<p>Subsidies: providing targeted subsidies and irrevocable allocation for research works on ES technologies and alternative energy, production and development of new EE appliances and technologies (Law of Ukraine, 1.07.1997, # 74/94-VR)</p>	<p>Loans on preferential terms: - mechanism for the use of state budget funds under the program “State support of energy efficiency measures through the mechanism of cheaper loans”. Budget funds are directed for compensation of actual costs in the current budget period associated with the payment of interest on loans obtained by economic entities in national currency for investment projects aimed at improving the use of energy resources and strengthening companies competitiveness particularly related to a decrease in natural gas consumption. Compensation is provided on a competitive basis in the amount of National Bank of Ukraine discount rate ruling on a date of payment of the mentioned interest, but no more than the interest rate on loans obtained by such economic entities (Cabinet of Minister of Ukraine, 13.04.2011, # 439); - partial reimbursement by the state of the loans involved in the purchase of EE equipment and/or materials for condominiums, housing cooperatives, owners of private homes to stimulate EE measures. Partial reimbursement of loan amount is carried out through the credit programs of Public JSC “State Savings Bank of Ukraine”, JSC “The State Export-Import Bank of Ukraine” and JSC “Ukrasbank” (Cabinet of Minister of Ukraine, 8.04.2015, # 231)</p>
<p>Tax incentives: - providing tax incentives to enterprises which produce ES equipment, technology and materials, means of measurement, control and management of energy resources, to manufacturers of equipment for alternative and renewable energy and alternative fuels; - providing tax incentives to enterprises which use equipment that runs on alternative and renewable energy and alternative fuels; - exemption from value added tax and customs duties on imports of: EE equipment produced in Ukraine, equipment that runs on renewable energy sources, ES equipment and materials, means of measurement, control and management of energy resources, equipment and materials for alternative fuels production or for energy generation from renewable energy; - exemption from value added tax and customs duties on imports of: materials, equipment and components used to manufacture equipment that runs on renewable sources; raw materials, equipment and components used for alternative fuels production or for energy generation from renewable energy sources; EE equipment, materials and products operation of which provides savings and rational use of energy resources; means of measuring, control and management of energy resources; - establishing higher depreciation rates for ES fixed assets (Tax Code, 2.12.2010, # 27-55-VI; Law of Ukraine, 1.07.1997, # 74/94-VR)</p>	<p>Funds: system of state and municipal funds for ES: - State Energy Saving Fund with a limited list of revenue sources; - Energy Saving Funds of Local Governments (funding for EE programs of companies); - Special Fund of the State Budget of Ukraine, which may provide funds to promote EE technologies in various sectors of economy. Additionally, in Ukraine there are several initiatives of international funding, including «Eastern Europe Energy Efficiency and Environment Partnership» (E5P – the multidonor fund created by Swedish initiative; the fund provides direct investments in increasing EE, including installation of central heating and electricity facilities), World Bank, EBRD, Nordic Environment Finance Corporation (NEFCO) and others that also provide funding for EE projects in Ukraine (Law of Ukraine, 1.07.1997, # 74/94-VR; Weiss et al., 2014)</p>
<p>Grants: providing grants (in addition to loans) by international and national institutions (such as State Fund for Local Self-Government in Ukraine, Regional Development Fund, International Renaissance Foundation, State Agency on Energy Efficiency and Energy Saving of Ukraine) on a competitive basis (Weiss et al., 2014)</p>	

Economic mechanisms of government support

Figure 2. Main economic mechanisms of government support for EE and ESCOs market in Ukraine, developed by the author

In our view, the following directions and mechanisms are needed to stimulate energy service business development in Ukraine:

- *information support*: conducting large-scale campaigns to promote EE measures and ESCOs that implement them, involving all means of media; creating an extensive network of regional energy agencies to consult economic entities how to use practical possibilities of ES with concluding energy service contracts, how to receive cofinancing, grants, concessional loans etc.;

- *budgetary commitments*: adding budget funds allocated by the government for ES programs to the list of protected articles of the state budget and strict control over the time and the volume of these funds to consumers. Currently, budgetary funds allocated for ES often come to end users at the end of a budget year when money cannot be fully spent and therefore must be returned to the state budget unused;

- *anticorruption changes*: fighting corruption at all management levels; improving public procurement procedures, increasing their transparency, exclusion of abuses and unfair competition;

- *improving the regulatory framework*: establishing transparent mechanisms for utility tariffs; clear identification of owners of utility objects and their structural elements; resolution of legal issues related to payments for ESCOs services by the owners of apartment buildings where there are no condominiums through the mechanism of utilities payments; state certification/accreditation of ESCOs followed by the provision of state guarantees and benefits;

- *energy management and standardization*: introduction of mandatory energy management and energy audits for enterprises and institutions of all forms of ownership; establishing stricter EE standards for construction and reconstruction of buildings; determining the timing and the rates of gradual EE improvement of existing buildings;

- *improving metrological base*: equipping all consumers with devices for resources consumption accounting through the implementation of relevant state programs. This will help create economic interest of consumers in saving resources and avoiding their unproductive losses and determine the baseline in power consumption when concluding energy service contracts and monitoring their results;

- *organizational and financial support*: state guarantees for loans with low credit rates on EE projects for ESCOs and their customers; development of various ESCOs financing schemes of ES projects for different types of customers that are successfully used in foreign practice (such as shared savings, guaranteed savings, delivery contracting, chauffage, integrated energy contracting etc. (Bertoldi et al., 2014)); improving the system of multilevel EE funds on the basis of EE measures self-financing, when the profit from implementation of a previous ES project is invested in a following one.

Thus, in the near future the priority for Ukraine in the field of EE should be the implementation of the proposed directions and mechanisms that will activate ES projects in Ukraine with the help of ESCOs and provide EE development in all Ukrainian regions.

Conclusions. Funding mechanisms used by ESCOs allow implementing highly effective ES measures even under economic crisis and the absence of free funds. In turn, the development of the ESCOs industry needs strong state support in the form of loans at low interest rates, introduction of mandatory energy audits for economic entities, promotion of energy services etc. Only in this case we can expect that ES

processes in Ukraine will become the basis for building a new "green" energy efficient national economy.

References:

Податковий кодекс України від 02.12.2010 № 2755-VI зі змінами від 01.07.2015 // zakon.rada.gov.ua.

Про внесення змін до Бюджетного кодексу України щодо запровадження нових інвестиційних можливостей, гарантування прав та законних інтересів суб'єктів підприємницької діяльності для проведення масштабної енергомодернізації: Закон України від 09.04.2015 № 328-VIII // zakon.rada.gov.ua.

Про електроенергетику: Закон України від 19.10.1997 № 575/97-ВР зі змінами від 16.07.2015 // zakon.rada.gov.ua.

Про енергозбереження: Закон України від 01.07.1994 № 74/94-ВР зі змінами від 09.05.2015 // zakon.rada.gov.ua.

Про запровадження нових інвестиційних можливостей, гарантування прав та законних інтересів суб'єктів підприємницької діяльності для проведення масштабної енергомодернізації: Закон України від 09.04.2015 № 327-VIII // zakon.rada.gov.ua.

Про внесення змін до постанов Кабінету Міністрів України від 1.03.2010 № 243 і від 17.10.2011 № 1056: Постанова Кабінету Міністрів України від 8.04.2015 № 231 // zakon.rada.gov.ua.

Про затвердження Державної цільової економічної програми енергоефективності і розвитку сфери виробництва енергоносіїв з відновлюваних джерел енергії та альтернативних видів палива на 2010–2015 роки: Постанова Кабінету Міністрів України від 1.03.2010 № 243 зі змінами від 27.04.2011 // zakon.rada.gov.ua.

Про затвердження Порядку використання коштів, передбачених у державному бюджеті для державної підтримки заходів з енергозбереження через механізм здешевлення кредитів: Постанова Кабінету Міністрів України від 13.04.2011 № 439 зі змінами від 15.08.2014 // zakon.rada.gov.ua.

Про Національний план дій з відновлюваної енергетики на період до 2020 року: Розпорядження Кабінету Міністрів України від 01.10.2014 № 902-р // zakon.rada.gov.ua.

Про схвалення Енергетичної стратегії України на період до 2030 року: Розпорядження Кабінету Міністрів України від 24.07.2013 № 1071-р // zakon.rada.gov.ua.

Енергоефективність у регіональному вимірі. Проблеми та перспективи: аналітична доповідь / А.І. Шевцов, В.О. Бараннік, М.Г. Земляний, Т.В. Рязова. – Дніпропетровськ: РФ НІСД, 2014. – 78 с.

Оцінка енергетичної політики України у порівнянні з кращими європейськими практиками реалізації політики в сфері енергоефективності та відновлюваної енергетики / Д. Вайс, В. Каленборн, Г. Брандл та ін.; За ред. Д. Вайса. – К., 2014 // journal.esco.co.ua.

Порошенко підписав закони про енергосервісні компанії / Zik.ua. – 8.05.2015 // zik.ua.

Сотник І.М., Мазін Ю.О. Економічні проблеми та перспективи розвитку енергосервісних компаній в Україні // Наукові засади ресурсозбереження в системі антикризового управління і відтворення економіки: Матеріали міжнародної науково-практичної конференції (30–31 січня 2015 р., м. Хмельницький, Університет економіки і підприємництва): У 2-х ч. – Хмельницький, 2015. – Ч. 1. – С. 67–70.

Фінансування енергоефективних заходів / Teplydim. – 2015 // teplydim.com.ua.

Bertoldi, P., Boza-Kiss, B., Panev, S. et al. (2014). The European ESCO Market Report 2013 // iet.jrc.ec.europa.eu.

Energy Efficiency Indicators (2015). Indicators by Country/Region 1990–2013 // www.worldenergy.org.

Scheuer, S. (ed.) (2013). EU EE Directive (2012/27/EU). Guidebook for Strong Implementation. The Coalition for Energy Savings // awsassets.panda.org.

Stepanenko, V. (2012). Report for ESCO in Ukraine // www.ecosys.com.ua.

Стаття надійшла до редакції 29.07.2015.