

## CONVERTING DOMESTIC WASTES INTO RENEWABLE SOURCE TO PRODUCE ELECTRICAL AND THERMAL ENERGY: LEGAL ASPECTS

The paper analyzes the legal aspects of economic activity on the transformation of domestic output at reducing resource for the production of electricity and heat. It is proved that the construction of new incinerators in regions of Ukraine will help address priorities in the direction of environmental security and energy independence.

**Key words:** waste, energy, regenerative fuels, recycling, alternative energy sources.

**Problem formulation.** Considerable part of Ukrainian land is occupied by landfills, most of which currently almost entirely exhausted its technological capacity. Annual volumes of waste collection ranged from 45 to 60 mln. m<sup>3</sup>, or 12–13 million tons. Landfills (dumps) are constantly being replenished with new waste: only for the last 2015 year 646,1 thousand m<sup>3</sup> or 104.9 thousand tons of non-recyclable waste has been taken for storage and disposal. People living in the immediate vicinity to the landfills are influenced by harsh environmental conditions which make it impossible to live a full life and preserve health. For years and decades such landfills are poisoning air and water sources, being cause of dangerous infections and constant fire threat. The legal base for the energy technologies development based on the use of waste as a renewable fuel, may become the perspective direction of solving the acute problem of waste disposal in Ukraine.

**The article aim is** to develop proposals to improve the legal framework on the use of waste as a renewable energy. The following interrelated **problems** must be solved to achieve this: 1) to analyze the statistical data on the total formation, transportation and disposal volume of waste in all regions of the country; 2) to define legal aspects of waste management in Ukraine; 3) to check the competencies scope of the central authorities governing the production of electricity and heat by recycling waste; 4) to formulate proposals for distribution in the regions the practice of using waste as a renewable fuel for energy production.

**Object of the survey** is a system of relations, fixed by a body of law governing the organizational issues of electric or thermal energy production by means of waste recycling. The subject of the survey constitutes the promising technology directions of converting domestic wastes into renewable source of fuel introduced in the production cycle of power generating companies in Ukraine.

**Recent research analysis.** The issues related to the elaboration of waste recycling ways have been the subject of attention for environmental experts, chemists, farmers, concepts authors and state programs on environmental management. The analysis of publications of Ukrainian and foreign scholars on the subject shows that the study mainly dealt with issues on environmental safety and monitoring of soils (E. Y. Zhovynskiy, V. I. Klymenko, V. A. Kovda, V. I. Kravtsova, G. I. Krasovskiy, I. Y. Kuraieva, A. V. Stepanchuk), land use and protection (A. S. Danylenko, K. G. Radchenko, Y. M. Alboschyi), specific environmental aspects of waste management (A. I. Korabliova, V. I. Lialko, V. V. Medvediev, G. I. Rud'ko, M. K. Shykula). However, before now the issues of legal regulation of electric and thermal energy by recycling waste have been given not enough attention, so this study is an attempt to fill the existing gap.

**Main material presentation.** Within this study in order to collect relevant statistical and other information there were sent requests to a number of central executive bodies, the National Commission for state regulation in the sphere of energy and utility services, the Council of wholesale electricity market, as well as city councils of regional centers (except the temporarily occupied territory of the Autonomous Republic of Crimea and Donbas regional centers). In particular, the subject of requests was to obtain information for the period from 2012 to 2016 concerning: the total amount of waste (garbage) generated and collected in each city; availability, deployment and major areas of legal landfills for acceptance and recycling of various waste categories; existing applicable waste management technologies and others.

The empirical research base became the official information received in response to requests received directly from the above named bodies.

According to Art. 30 of the Law of Ukraine «On local government in Ukraine» resolving issues of collection, transportation, recycling and disposal of waste lies

within the jurisdiction of the executive bodies of village, town and city councils [1]. However, art. 20 of the Law of Ukraine «On Waste» provides that making and keeping the Register of entities collecting, processing and disposing waste and Register of waste removal places are under the authority of local state administrations [2]. All places of removal of waste – landfills, complexes, pits, buildings, subsoil areas etc. (those currently operating, closed, mothballed) are subject to be included in the Register of removal of waste. Register of removal of waste as defined by Paragraph 4 of the Cabinet of Ministers of Ukraine Resolution dated on 03.08.1998 No. 1216 «On approval of the removal of waste places Register keeping» – it's a system of data obtained as a result of the accounting and inventory of all objects and specially designated places where the operations of removal of waste take place.

The Law of Ukraine «On Waste» in art. 1 specifies that this term should be understood as any substances, materials and objects that were formed during the production or consumption process, as well as goods (products) that wholly or partially lost their consumer properties and have no further use at the place of its formation or detection and from which the owners gets rid, intends or has to get rid by recycling or removal [2].

As referred to the official data of the Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine (hereinafter – the Ministry of Regional Development, a letter dated on 22.06.2016 by ref. No. 8/11-144-16), waste collection volumes were as follows: 2012 – 58900000 m<sup>3</sup>, or 13.2 million tons; 2013 – 58.9 mln. m<sup>3</sup> or 12.7 mln. tons; 2014 – 45.4 mln. m<sup>3</sup>, or 9.7 mln. tons; 2015 – 48.0 mln. m<sup>3</sup>, or 9.2 mln. tons. The volume of shipments of waste: in 2012 – 58.9 mln. m<sup>3</sup>, or 17.6 mln. tons; 2013 – 58.9 mln. m<sup>3</sup>, or 12.7 mln. tons; 2014 – 45.4 mln. m<sup>3</sup>, or 9.7 mln. tons; 2015 – 43,8 mln. m<sup>3</sup>, or 9.2 mln. tons.

Including:

– to procuring centers of recycled materials there were transported: in 2012 – 9.0 thousand m<sup>3</sup>, or 35.7 thousand tons; 2013 – 24.9 thousand m<sup>3</sup> or 128.6 thousand tons; 2014 – 84.7 thousand m<sup>3</sup> or 142.3 thousand tons; 2015 – 816.2 thousand m<sup>3</sup> or 132.5 thousand tons;

– to waste recycling enterprises there were transported: in 2012 – 1.4 mln. m<sup>3</sup> or 240.3 thousand tons; 2013 – 1.3 mln. m<sup>3</sup> or 220.0 thousand tons; 2014 – 308.1 thousand m<sup>3</sup>, or 73.0 thousand tons; 2015 – 725.7 thousand m<sup>3</sup> or 128.3 thousand tons;

– to the composting plots there were transported: during 2012 – 2014 the waste was not transported, but in 2015 – 17.1 thousand m<sup>3</sup>, or 2.8 thousand tons of waste was transported;

– to waste incineration plants there were transported: in 2012 – 1.4 mln. m<sup>3</sup> or 262.4 thousand tons; 2013 –

676.5 thousand m<sup>3</sup> or 147.0 thousand tons; 2014 – 753.6 thousand m<sup>3</sup> or 149.5 thousand tons; 2015 – 1.3 mln. m<sup>3</sup> or 254.3 thousand tons;

– to landfills (dumps) there were transported: 2012 – 55.8 mln. m<sup>3</sup>, or 17.1 million tons; 2013 – 56.7 million m<sup>3</sup>, or 12.2 million tons; 2014 – 43.5 mln. m<sup>3</sup>, or 9.4 mln. tons; 2015 – 40.9 million m<sup>3</sup>, or 8.7 mln. tons.

The waste incomes volume for processing and (or) disposal was as follows: 2012 – 2.1 mln. m<sup>3</sup> or 394.2 thousand tons; 2013 – 1.8 mln. m<sup>3</sup> or 325.8 thousand tons; 2014 – 1.4 mln. m<sup>3</sup> or 252.5 thousand tons; 2015 – 2.7 mln. m<sup>3</sup> or 481.0 thousand tons.

The volumes of waste after sorting and selecting of raw valuable components were as follows: 2012 – 273.2 thousand m<sup>3</sup>, or 51.7 thousand tons; 2013 – 362,5 thousand m<sup>3</sup>, or 60.1 thousand tons; 2014 – 458.7 thousand m<sup>3</sup>, or 89.5 thousand tons; 2015 – 1.1 mln. m<sup>3</sup> or 170.6 thousand tons.

Volumes of non recyclable residue were as follows: 2012 – 416.4 thousand m<sup>3</sup>, or 88.2 thousand tons; 2013 – 676.1 thousand m<sup>3</sup> or 125.5 thousand; 2014 – 326.1 thousand m<sup>3</sup>, or 57.9 thousand tons; 2015 – 646,1 thousand m<sup>3</sup> or 104.9 thousand tons. Including the residue which was transported to landfills (landfill) for disposal: in 2012 – 416.4 thousand m<sup>3</sup>, or 88.2 thousand tons; 2013 – 676.1 thousand m<sup>3</sup> or 125.5 thousand tons; 2014 – 326.1 thousand m<sup>3</sup>, or 57.9 thousand tons; 2015 – 646,1 thousand m<sup>3</sup> or 104.9 thousand tons. The non-recyclable residue was not transported to waste incineration plants.

During 2012 the following amount of energy was produced: electricity – 0 kW, heat – kcal 319,572,534.9 (including Dnipropetrovsk region – 95359534.9 calories, Kyiv city – 224 213 000 kcal). During 2013 the following amount of energy was produced: electricity – 0 kW heat – 221 480 300 kcal (Kyiv city only). During 2014 the following amount of energy was produced: electricity – 15.5 million kW (Kyiv region), heat – 225 409 900 kcal (Kyiv city). During 2015 the following amount of energy was produced: electricity – 0 kW heat – 311 042 400 kcal.

Norm-definition of the current Law of Ukraine «On alternative energy sources» does not indicate directly to the use of waste as renewable energy and currently classifies solar, wind, geothermal, wave energy, tidal, hydropower, biomass, gas from organic waste, gas from sewage treatment plants, biogas and secondary energy resources to such kinds of energy, which include blast furnace and coke gas, methane gas from degassing of coal deposits, converting of waste energy potential of technological processes (Parag. 1, Art. 1) [3]. Development priorities and projects implementation conditions of heat and electricity generation based on waste are reflected in the Energy Strategy of Ukraine till 2030 [4],

approved by the Cabinet of Ministers of Ukraine on 24.07.2013 No. 1071-r. Action Plan for Energy Strategy implementation, which was designed according to the parag. 2 of the Resolution dated on 24.07.2013 No.1071-r did not enter into force.

Concerning the matters of waste management the legislation of Ukraine relies mainly on the centralization strengthening idea. Thus the entities of economic management at the regional level are severely limited in their ability to participate in the development of effective ways of waste management and, accordingly, exemption of valuable land resources which are now occupied as landfills (dumps), and therefore used irrationally. Thus, in accordance with art. 23 of the Law of Ukraine «On Waste» formation and maintenance of state data bank of Ukraine concerning introduction of waste management technologies lies within the competence of the central executive body that implements the state policy in the field of environmental protection [2]. However, today the most common «technology» is the following: waste disposal is based only on compacting of non-recyclable garbage and the rest of waste using bulldozers which is transported to landfills (dumps) and covered with layers of soil. Meanwhile in the EU appropriate institutions not only established separate collection and sorting of waste long ago, but also launched production of bioenergy. More than 50% of garbage is processed to produce recycled materials and various sorts of materials. For comparison, in Ukraine only up to 5% of waste is being processed, and the rest remains in landfills.

The Ministry of Energy and Coal Industry of Ukraine management scope (hereinafter – Minenergouglia) does not include the companies that produce electrical and thermal energy by burning waste. However, according to the Regulations of the Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine approved by the Cabinet of Ministers of Ukraine on 30.04.2014 Number 197 the Ministry of Regional Development is the main body in the system of central executive bodies to form and implement public policies in particular on the development of regions and housing and municipal economy, as well as in the use of alternative fuels sphere [5].

The assignment of issues related with the use of alternative fuels and energy to competence of the Ministry of Regional Development is a debatable decision and, at first glance, may cause some reservations because the Ministry of Regional Development, as opposed to Minenergouglia can hardly have professionals and developed practice in energy issues. There is high probability of a problematic situation in which the possible target indicators developed by the Ministry of Regional

Development may not fully coincide (or do not match) with the sole position of the state in strategic issues of alternative energy sources (fuels). However, it will help to focus the efforts of the Ministry of Regional Development specialists to start «from scratch» in these areas.

Thus, at present the whole energy sector, including alternative energy, is under management of Minenergouglia and production of electricity and heat from waste turned to be so «alternative» that it appeared within the jurisdiction of the Ministry of Regional Development. At present we can not speak about any positive or negative consequences of this division of competence for the development of energy and development of technologies of recycling of waste, because it takes time to estimate. In any case, there are grounds to state these facts as illustrative and interesting example in order to understand and explain its possible promising outlook.

Disposal of waste by using it as alternative fuel or the production of electricity and heat as an industry is derived from the overall development strategy of the energy sector and all the questions are referred to the competence of the Ministry of Regional Development. This means that the figures that show the status and effectiveness of the use of waste as alternative fuel source will not be considered during the development of promising areas of the energy industry, will not appear in the overall balance of fuel, will not participate in a Unified Energy System will not be taken into account during the formation of a unified tariff policy and in the development of various kinds of targeted state programs (including programs for promoting alternative energy producers and their planned share in total energy production).

On the other hand, this status will consider «garbage» energy sector as a separate industry with its features, to some extent, «elite» field. Now, as you know, these individual and special sectors became coal, nuclear power, production of gas and oil fuel, etc., and now actually the use of waste as a source of fuel and energy extraction starts its development. And this industry is also directly related to the issues of energy independence of Ukraine, as well as solution of a number of problems related environmental security and regional environmental management. All this is possible and perspective in view of the fact that waste (garbage) is actually a renewable fuel, and its use is consistent with the state strategy of Ukraine in promotion of «green» energy.

Building plants producing heat or electricity from burning garbage near the landfills would have helped to solve the problem. Now in Ukraine only one plant «Energiya» in Kyiv performs such functions. According to estimates of PJSC «KYIVENERGO» (letter dated on 06.22.2016 ref. No.058/4 / 2-6168) the thermal energy

produced at the plant by burning solid waste is enough to provide about 60 multistory buildings of residential area Pozniaky, that is it allows to emit more than 100 Gcal of heat as hot water and heating, natural gas consumption in PJSC «Kyivenergo» will be reduced by 15 million m<sup>3</sup> at the heating season.

PJSC «Kyivenergo» operates on the basis of economic accountability and is the subject of private ownership. It should be taken into account that the company is a part of the energy company «DTEK», the owner and ultimate recipient of profits of which is actually one person (Akhmetov). In case if the owner of power generating company was the local community (communal ownership), the volume of revenues to the local budget, respectively, would be more considerable that would contribute to economic growth at the level of individual territorial community (or several communities if they unite) and improve the living standards of the citizens, who are their members. With this in mind, during the development of planning documents for the construction of new waste processing facilities (lines, plants, etc.) in other cities of Ukraine it is advisable to consider from the perspective of the communal ownership benefits. It is also urgent to provide the conditions under which a company could be privatized, and strictly adhere to these conditions. After all, as previously performed privatization of Ukrainian energy companies have shown, its negative consequence became lack of control over the formation of investment programs. Further, it caused an increase in tariffs, tax evasion schemes through the use of transfers between subsidiaries, unjustified staff reductions and violation of labor rights. But in recent years to these consequences has attached the availability of business relations with the aggressor country – the Russian Federation and the occupied territories.

Today those regions of Ukraine, where construction projects of waste processing complexes are developed but not yet implemented, the main problem is the search for investors. If their local governments will change tactics and focus on such solution of the problem as the

unification of the financial resources of several local communities, it will finally help to achieve some progress towards the creation of regional utility companies for sorting, recycling waste and producing electricity or heat. The possibility to unite on the basis of agreement of communal property and budget funds, to implement joint projects or to jointly finance (maintain) communal enterprises for territorial communities of villages, towns and cities is guaranteed by the Constitution of Ukraine in art. 142 and the European Charter of Local Self-Government Art. 6. In determining the location, in the future of each company there should be taken into account such factors as inter-regional integration connections, innovative activity, organizing transport networks and more.

**Conclusions.** Construction of new incineration factories in different regions of Ukraine will strengthen regional economic independence. Household waste should be considered as completely free raw materials and renewable resources for power generation companies. Given the presence of significant difficulties in attracting investors and negative experience of concentration of assets owned by individuals, new waste processing facilities (factories, plants, production lines and sorting recyclable materials lines etc.) can be built at the expense of local budgets by appropriate territorial communities pooling their financial resources. The electricity or heat produced in this way will provide for the needs of those localities that will be connected to its network. For individuals living in localities provided with electric and (or) heat energy generated at such enterprises, it is appropriate to set preferential tariffs for utilities to encourage citizens' conscientious attitude towards the preservation of clean environment. At the regional level with the help of tariff regulation it is quite possible to create the conditions under which the localities situated at a short distance from the incineration factories would become more attractive for living and their residents would have material interest for responsible attitude to environmental conservation and sustainable use of natural resources.

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І. В. КРЕМЕНОВСЬКА

кандидат юридичних наук, старший науковий співробітник, вчений секретар  
Інституту економіко-правових досліджень НАН України

**ПЕРЕТВОРЕННЯ ПОБУТОВИХ ВІДХОДІВ НА ВІДНОВЛЮВАНЕ ДЖЕРЕЛО  
ДЛЯ ВИРОБНИЦТВА ЕЛЕКТРИЧНОЇ І ТЕПЛОВОЇ ЕНЕРГІЇ: ПРАВОВІ АСПЕКТИ**

У статті проаналізовано правові аспекти господарської діяльності з перетворення побутових відходів на відновлювальний ресурс для виробництва електричної та теплової енергії. Обґрунтовано, що будівництво нових сміттєспалювальних заводів в областях України буде сприяти вирішенню першочергових завдань у напрямі забезпечення екологічної безпеки та енергетичної незалежності.

**Ключові слова:** відходи, енергетика, відновне паливо, утилізація, альтернативні джерела енергії.

И. В. КРЕМЕНОВСКАЯ

кандидат юридических наук, старший научный сотрудник, ученый секретарь  
Института экономико-правовых исследований НАН Украины

**ПРЕВРАЩЕНИЕ БЫТОВЫХ ОТХОДОВ В ВОЗОБНОВЛЯЕМЫЙ ИСТОЧНИК  
ДЛЯ ПРОИЗВОДСТВА ЭЛЕКТРИЧЕСКОЙ И ТЕПЛОЙ ЭНЕРГИИ: ПРАВОВЫЕ АСПЕКТЫ**

В статье проанализированы правовые аспекты хозяйственной деятельности по преобразованию бытовых отходов в восстановительный ресурс для производства электрической и тепловой энергии. Обосновано, что строительство новых мусоросжигательных заводов в областях Украины будет способствовать решению первоочередных задач в направлении обеспечения экологической безопасности и энергетической независимости.

**Ключевые слова:** отходы, энергетика, восстановительное топливо, утилизация, альтернативные источники энергии.

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