

*Рассмотрены некоторые особенности договорных отношений в современной деловой практике субъектов хозяйствования.*

**Ключевые слова:** *деловые контракты, отношения, контракты на продажу или покупку продукции, договор на услуги, контракты на поиск решения, контракты под ключ, аутсорсинговые контракты, продукт, цена, сроки поставки, гарантия*

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## **BIOENERGY DEVELOPMENT IN POLAND AND UKRAINE IN THE CONTEXT OF INCREASE OF SOCIAL BUSINESS RESPONSIBILITY**

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**Abstract.** *This article is devoted to the improvement of social responsibility due to the development of bioenergy sector. The basis of this research was to investigate the Polish experience in the field of bioenergy and evaluation of its development in Ukraine. The study of the relationship of social responsibility and bioenergy based on an assessment reduction of primary energy resources and increase of biological.*

*Considered features of the legislative framework of bioenergy sector in both countries. Obligations of Poland in line with measures taken by the European Commission restrict the use of first generation biofuels because of indirect land use change in the cultivation of raw materials for their production needs and in accordance with the increase of greenhouse gases when burned. The social and environmental factors of increasing the use of biological energy are analyzed.*

**Keywords:** *bioenergy, renewable energy sources, primary energy, environment, social responsibility*

**Introduction.** World production and use of bioenergy is growing due to factors such as increase of energy safety and environmental security. However, the interest to invest in the industry also manifested by the following factors: the development of effective technologies and state programs. As a

result, for agriculture and forestry there are new markets for their products, partially reduced dependence on imported mineral fuel prices and therefore increased the positive impact on the environment. Enterprise activities in this business and agriculture, forestry will increase the level of social responsibility.

In 2014 Poland entered to the European Union and is committed to increase the share of renewable energy sources (RES) in energy balance of the country, particularly in 2012, this share was 8.8% and for 2020 predicted – 21% [3].

Unlike Poland, in Ukraine until today questions about the development of bioenergy sphere remain open, due to imperfect legal regulation, economic and social instability, which greatly limits the perception of the industry as a guaranteed supplier of energy resources to market. In 2015 was adopted the Decree of President of Ukraine "On the Strategy for Sustainable Development" Ukraine-2020 ", the main task of which is expected, ensure energy safety and transition to energy-efficient use and energy consumption with the introduction of innovative technologies.

Despite on the great scientific and practical interest to this sphere, the issue of mechanisms implementation of partial substitution of mineral fuel in Poland and Ukraine, remain open. This connected with many factors: regulatory, technical, economic, environmental and social [11]. However, unlike Ukraine, in Poland are functioning national and European standards in the bioenergy field, which are obligatory and are prerequisite for increase their production.

**Analysis of recent researches and publications.** The issues of bioenergy sector in Poland and Ukraine are researched by many scientists: J. Gołębiewski, G. Geletukha, M. Hamulchuk, T. Kuts, O. Shpychak and others.

Studying Polish literature in the sphere of bioenergy should be noted that the questions about development of biodiesel, bioethanol and biogas are involved many scientists. Thus, considered the impact of oil prices on agricultural products [5]. In other researches is considered ensuring the production of raw materials of biological energy sources.

It is important to note that in Ukraine research of legal regulation, evaluation and capacity building, forecasting, and lobbying the sector at the national level are engaged many organizations, including the Bioenergy Association of Ukraine, Scientific and technical center "Biomass", Agency for Renewable Energy, International Finance Corporation and other organizations and institutions.

Analyzing the Ukrainian literature sources in this area should be emphasized that many researches regarding biogas concerning technical aspect, e.g. G. Geletukha, F. Isermeyer, T. Zheliezna, M. Kaltshmidt, D. Thrän, J. Zeddies and others.

In general need to emphasize the importance of learning the bioenergy sector, which should be considered at the point of view energy, economic, environmental and social components of development.

**Purpose.** The purpose of this paper is to assess the level of development the bioenergy sector in Poland and Ukraine as a prerequisite for

reducing primary energy resources imports and consumption in both countries. Consider legislative base for biological energy sources, as well as social and environmental aspects of its capacity growth.

**Methods.** The theoretical and methodical basis of the study is the provision of economic theory, research and development of domestic and foreign engineers, economists on development of bioenergy industry, laws and regulations in Poland and Ukraine, the statistics data of the two countries.

To achieve goal in this article were used the following techniques and scientific methods: induction; deduction; statistical observation; methods of causation and abstraction.

**Results.** The development of bioenergy in Poland and Ukraine is identified with necessary to improve energy safety, reducing dependence on imported mineral fuels, solving social and environmental problems.

Poland has an overall low import dependency, although increasing, mostly due to the presence of national sources of solid fuels. The overall increase is mostly due to lower exports of hard coal. However, import dependency is high for crude oil, and also above EU average as regards gas. Poland imports a significant share of its crude oil and gas needs from Russia, i.e. about 95% and 64%, respectively, of total imports in 2013, which translates into a relatively high country supplier concentration index. However due to the recent investments in gas infrastructure improvements are seen in this regard. Poland experiences a below EU average energy trade deficit (expressed as percentage of GDP) [2].

In the total, dependence on imports of fuels (minus exports) in Poland in 2013 to gross domestic consumption was 26%, in contrast to the EU-28 less, where this index was 53%. Dependence on oil and oil products during this period was 92% (EU-28 – 87%), natural gas – 75% (EU-28 – 65%) (Table 1).

## 1. Energy balance in Poland in 2013, ktoe

Indicators	Total (all products)	Solid fossil fuel	Crude oil and petroleum products	Gas	Nuclear heat	Renewable energies	No-renewable energy	Electricity
Primary production	70578	56835	958	3823	-	8511	451	-
Other sources (recovered products)	852	301	550	2	-	-	-	-
Recycled products	51	-	51	-	-	-	-	-
Imports	45448	6456	27886	10259	-	176	-	671
Stock changes	1483	1305	441	-279	-	16	-	-
Export	20112	11939	6892	77	-	144	-	1059
Bunkers	141	-	141	-	-	-	-	-
Direct use	0	0	-	-	-	-	-	-

Gross Inland Consumption	98159	52957	22853	13727	-	8559	451	-389
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Source: [7].

Note: Ktoe means thousand tons of oil equivalent.

Based on the Eurostat's energy balances the Gross inland consumption is defined as sum of Primary production, Primary product receipt, Other sources (recovered products), Recycled products, Imports, Stock changes and minus Exports, Bunkers, Direct use.

In the energy balance of Ukraine in 2014 the amount of the total primary energy supply amounted to 105.7 mln t of oil equivalent, that decreased in compare to 2013 on 9.8%. Supply of primary energy in 2014 is characterized by structural changes: decrease in the share of coal to 33.7%, natural gas to 31.6%, while the growth of nuclear energy was 22.0% and 10.1% of oil. The share of renewable energy sources (hydro, geothermal, solar, wind and biofuels) accounted to 2.6%.

The net import (difference between imports and exports) of energy resources of primary energy decreased by 12.8% and on 26.0% provided the energy supply of the country. In the structure of energy import the share of natural gas is the largest and is about 45%, the volume of imported coal – 30%, crude oil and oil products – 24%. In the export structure of energy 70% is the coal, 12% – crude oil and petroleum products, 10% electricity and 7% bioenergy.

Sector of final consumption reflects the primary and secondary energy that consumers were used. On the final consumption of fuel and energy in 2014 was used 61.5 mln t of oil equivalent that is on 11.6% less than in 2013. Reduction of final energy consumption occurred in all consumption directions. Among the main energy sources the share of natural gas in the structure of final consumption continues to be the largest – 34.1%. The second largest source of energy is electricity; its share was 18% (Table 2).

## 2. Structure of final energy consumption in Ukraine

Year	Final energy consumption, thousand t of oil equivalent	To the volume of final consumption, %					
		Gas	Coal and peat	Crude oil and oil products	Electricity	Heat energy	Biofuels
2011	75852	38,5	12,4	16,1	15,8	15,8	1,4
2012	73107	36,4	13,1	16,7	16,2	16,2	1,4
2013	69557	35,9	12,5	16,2	17,0	16,8	1,6
2014	61460	34,1	14,9	16,5	18,0	14,5	2,0

Source: [8].

Due to the high dependence on imports of energy resources in the fuel and energy balance of both countries, it is necessary to diversify the production of energy resources, particularly through renewable energy sources.

In Poland, the share of renewable energy in 2013 in the energy balance of the country according to the Polish Statistical Service was 11.9%. The share of renewable energy in Poland is associated primarily with the adoption of the Program of renewable energy development. The Council of Ministers in 2009 in Poland adopted the "Energy Policy until 2030", where the share of renewable energy up to 2020 should be 15 percent.

In the structure of energy consumption from renewable energy sources in Poland is dominated solid biofuels and in 2013 they amounted to 80 percent. The share of liquid fuels was 8.2%, wind energy – 6.2%, hydro energy – 2.5 % (Table 3).

### 3. Structure of renewable energy sources consumption in Poland in 2013

Renewable energy sources	TDj	In % to the total quantity of renewable energy sources
Solid biofuel	286 144	79,9
Solar energy	639	0,1
Hydropower	8 781	2,4
Wind energy	21 614	6,0
Biogas	7 593	2,1
Liquid fuel	30 944	8,6
Geothermal energy	778	0,2
Municipal wastes	1 490	0,4
Environment power	1 184	0,3
Total	357983	100,0

Source: [3].

In Ukraine, by the data of the State Statistics Service of Ukraine, the share of RES in gross final energy consumption reached to 3.62% in 2013, including biomass - 2.28% that is 63% of all renewable energy sources, or 1.61 mln t of oil equivalent (Table 4).

### 4. Share of RES and biomass in energy balance in Ukraine

Indexes	Years			
	2010	2011	2012	2013
Biofuels / waste in the gross final energy consumption, mln t of oil equivalent	1,40	1,45	1,47	1,61
Biofuels / waste in the gross final energy consumption, %	1,86	1,88	1,99	2,28
Share of biofuels/ wastes of all RES in the gross final consumption, %	62	67	68	63

Source: [9].

Analysing table 4, it can be noted that for the share of biofuels accounted most of the RES in gross final consumption in Ukraine. Thus, in 2013 biofuels in the final energy consumption of biofuels were 2.28% that is on 0.42% higher compared to 2010. The development of RES production and consumption are obvious, because every year is increased their number in the

energy balance of the country. A perspective direction of the biomass use is the production of bioenergy, which can lead to a significant reduction of energy consumption in both countries, particularly in agriculture.

Compare production of bioenergy in Poland and Ukraine in 2013, we can see that 88% is bioenergy sources in total consumption of renewable energy sources, in Ukraine – 67% that is only 1,61% in total energy consumption. Despite on small part of bioenergy sources in energy balance of Ukraine, we have great energy potential of biomass. Energy potential in Ukraine in 2013 was 27.47 mln t of oil equivalent. The biggest share of economic potential of biomass belongs to straw cereals, wastes of corn and energy crops [9].

In 2009 was adopted the Law of Ukraine "On amendments to some laws of Ukraine to promote the production and use of biofuels" in order to stimulate production and use of biofuels, the development in Ukraine of the national fuel market through the involvement of biomass as a renewable raw material for production of biofuels. There is supposed to increase the share of alternative fuels to 20% of total fuel consumption in Ukraine until 2020 [6]. Another is National Action Plan on Renewable Energy to 2020 set the overall objective of the development of this sector in Ukraine to 2020 – contribution RES in gross ending energy consumption that has to be reach to 11% until 2020 in according to commitments of Ukraine as a member of the Energy Community [2, 10].

The European Commission justifies the need for measures to limit the use of first-generation biofuels by influenced of Indirect land Use Change (ILUC) on greenhouse gas emissions from the combustion of biofuels and bioliquids. These emissions occur when biofuels displace plants on the formerly protected lands (forests, natural grasslands and peatlands). The findings of the research the American Institute IFPRI that was ordered by the European Commission, show a significant effect on the impact of ILUC on emissions of greenhouse gas (GHG) [4].

The EU Energy and Climate Change Package (CCP) was adopted by the European Council on April 6, 2009. The Renewable Energy Directive (RED), which is part of this package, entered into force on June 25, 2009, and had to be transposed into national legislation in all Member States (MS) by December 5, 2010. The EU wants at least 10 percent of energy used in transport to come from biofuels by 2020, since this is where greenhouse gas emissions are increasing the fastest. The wider target is for clean energy to make up 20 percent of fuel used in transport, power stations, heating stations, and cooling stations combined. National targets will be set for each country's contribution to the overall goals. The CCP includes the "20/20/20" goals for 2020: a 20 % reduction in GHG emissions compared to 1990; a 20 % improvement in energy efficiency compared to forecasts for 2020; a 20 % share for renewable energy in the EU total energy mix. Part of this 20% share is a 10% minimum target for RES consumed by the transport sector, to be achieved by all member states [1].

On 11 of September 2013 the European Parliament decided that of these 10% only 5.5% may consist of first-generation biofuels. The rest should include second-generation bio-components (produced from waste, algae or cellulose), or other renewable energy sources such as biogas.

On April 28, 2015, the European Parliament approved the reform of the Renewable Energy Directive (RED), which includes a 7% cap on food crop based biofuels for the transport sector. The current blending of food crop based ethanol and biodiesel is estimated at respectively 3.3 and 4.3 percent.

Thus, in the future to address the reduction of greenhouse gas emissions and improve environmental conditions as in Poland and Ukraine, need to reduce energy consumption by improving energy efficiency and conservation, and to increase the use of RES.

**Discussion.** The development of bioenergy could open new opportunities for rural development in a harmonious combination of food safety and positive impact on the environment. The main aspects of this way should be: bioenergy integration into existing policies and programs for rural development; jobs creation; definition of indicators impact for rural development; combining these indicators in a comprehensive system in order to assess the viability of the activity in the field of bioenergy; monitoring and evaluation of investment to expand production of biological energy; estimation the value of food safety: availability, access, stability and consumption.

Assessing the impact of bioenergy on the environment indicates that natural systems can be significantly improved, or vice versa, somehow degraded. This issue is important in terms of ensuring sustainable production activity in the bioenergy industry. Therefore it is necessary to ensure the monitoring of GHG and their reduction due to replacement of mineral fuels on biological, tighten control over the restoration of soil fertility and protection of biodiversity. Conducting research and development should promote the rational development of bioenergy industry to achieve social and environmental effects, as well as the definition of the basic criteria to minimize production costs to increase its business competitiveness.

### Literature

1. Biofuels Barometer – reports of EuroObserverER for the period 2008–2013 [Electronic resource]. Access: <https://euobserver.com/>.
2. Commission staff working document. Country Factsheet Poland [Electronic resource]. Access: <http://data.consilium.europa.eu/doc/document /ST-14015-2015-ADD-22/en/pdf>.
3. Energy balance sheets. Statistical books [Electronic resource]. Access: <http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a>.
4. EU Biofuels Annual 2015 [Electronic source]. Access: [http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual\\_The%20Hague\\_EU-28\\_7-15-2015.pdf](http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%20Hague_EU-28_7-15-2015.pdf).
5. Hamulczuk M., Grudkowska S., Gederek S., Klimkowski C., Stanko S. (2013). Essential econometric methods of forecasting agricultural commodity prices, 90.1, 182.

6. Law of Ukraine “On amendments to some laws of Ukraine to promote the production and use of biofuels” from 21.05.2009 №1391-VI [Electronic source]. Access: <http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1391-17>.

7. Pakiet klimatyczno-energetyczny [Electronic resource]. Access: <http://www.energiaisrodowisko.pl/zarzadzanie-energia-i-srodowiskiem/pakiet-klimatyczno-energetyczny>.

8. Statistical data of the State Statistics Service of Ukraine [Electronic source]. Access : <http://www.ukrstat.gov.ua>.

9. Підготовка та впровадження проєктів заміщення природного газу біомасою при виробництві теплової енергії в Україні [Електронний ресурс]. – Режим доступу : <http://www.rea.org.ua/ru/usaaid-mer/81-booklet-heat-production>.

10. Про Національний план дій з відновлюваної енергетики на період до 2020 року : розпорядження Кабінету Міністрів України від 1 жовтня 2014 р. № 902-р [Електронний ресурс]. – Режим доступу : <http://zakon5.rada.gov.ua/laws/show/902-2014-%D1%80#n10>

11. Про стратегію сталого розвитку «Україна-2020» : указ Президента України [Електронний ресурс]. – Режим доступу : <http://zakon3.rada.gov.ua/laws/show/5/2015#n10>

## References

1. Biofuels Barometer – report of EuroObserver for the period 2008–2013 [Electronic resource]. Access: <https://euobserver.com/>.

2. Commission staff working document. Country Factsheet Poland [Electronic resource] / Access: <http://data.consilium.europa.eu/doc/document/ST-14015-2015-ADD-22/en/pdf>.

3. Energy balance sheets. Statistical books [Electronic resource]. Access: <http://ec.europa.eu/eurostat/documents/3217494/6898731/KS-EN-15-001-EN-N.pdf/e5851c73-9259-462e-befc-6d037dc8216a>.

4. EU Biofuels Annual 2015 [Electronic resource]. Access: [http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual\\_The%20Hague\\_EU-28\\_7-15-2015.pdf](http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%20Hague_EU-28_7-15-2015.pdf).

5. Hamulczuk M., Grudkowska S., Gederek S., Klimkowski C., Stanko S. (2013). Essential econometric methods of forecasting agricultural commodity prices, 90.1, 182.

6. Law of Ukraine “On amendments to some laws of Ukraine to promote the production and use of biofuels” from 21.05.2009 №1391-VI [Electronic resource]. Access: <http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1391-17>.

7. Pakiet klimatyczno-energetyczny [Electronic resource]. Access: <http://www.energiaisrodowisko.pl/zarzadzanie-energia-i-srodowiskiem/pakiet-klimatyczno-energetyczny>.

8. Statistical data of the State Statistics Service of Ukraine [Electronic source]. Access : <http://www.ukrstat.gov.ua>.

9. Підготовка та впровадження проєктів заміщення природного газу біомасою при виробництві теплової енергії в Україні [Електронний ресурс]. – Режим доступу: <http://www.rea.org.ua/ru/usaaid-mer/81-booklet-heat-production>.

10. Про Національний план дій з відновлюваної енергетики на період до 2020 року : розпорядження Кабінету Міністрів України від 1 жовтня 2014 р. №902-р [Електронний ресурс]. – Режим доступу: <http://zakon5.rada.gov.ua/laws/show/902-2014-%D1%80#n10>.

11. Про стратегію сталого розвитку «Україна-2020» : указ Президента



## РОЗВИТОК БІОЕНЕРГЕТИКИ В ПОЛЬЩІ ТА УКРАЇНІ В КОНТЕКСТІ ПІДВИЩЕННЯ СОЦІАЛЬНОЇ ВІДПОВІДАЛЬНОСТІ БІЗНЕСУ

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*Анотація.* Стаття присвячена вирішенню проблеми підвищення соціальної відповідальності бізнесу через розвиток біоенергетичної галузі. Основою дослідження цих питань було вивчення досвіду Польщі у галузі біоенергетики та оцінка її розвитку в Україні. Вивчення взаємозв'язку соціальної відповідальності бізнесу з біоенергетикою ґрунтується на оцінці зниження споживання первинних енергетичних ресурсів та нарощування біологічних.

Обґрунтовано особливості законодавчої бази галузі біоенергетики обох країн. Виконання зобов'язань Польщі, відповідно до вжитих Європейською комісією заходів, обмежують використання біопалив першого покоління через непряму зміну використання землі при вирощуванні сировини для потреб їх виробництва та, відповідно, збільшення парникових газів при згоранні. Проаналізовано соціальні й екологічні аспекти нарощування використання біологічних джерел енергії.

**Ключові слова:** біоенергетика, відновлювані джерела енергії, первинна енергія, навколишнє середовище, соціальна відповідальність

## РАЗВИТИЕ БИОЭНЕРГЕТИКЕ В ПОЛЬШЕ И УКРАИНЕ В КОНТЕКСТЕ ПОВЫШЕНИЯ СОЦИАЛЬНОЙ ОТВЕТСТВЕННОСТИ БИЗНЕСА

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*Аннотация.* Статья посвящена решению проблемы повышения социальной ответственности бизнеса посредством развития биоэнергетической отрасли. Основой исследования этих вопросов было изучение опыта Польши в области биоэнергетики и оценка ее развития в Украине. Изучение взаимосвязи социальной ответственности бизнеса с биоэнергетикой основывается на оценке снижения потребления первичных энергетических ресурсов и наращивания биологических.

Обоснованы особенности законодательной базы в области биоэнергетики обеих стран. Выполнение обязательств Польши, в

*соответствии с принятыми Европейской комиссией мерами, ограничивают использование биотоплива первого поколения из-за косвенной смены использования земли при выращивании сырья для их производства, и, соответственно, увеличение парниковых газов при сгорании. Проанализированы социальные и экологические аспекты наращивания использования биологических источников энергии.*

**Ключевые слова:** *биоэнергетика, возобновляемые источники энергии, первичная энергия, окружающая среда, социальная ответственность*