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Biofuels Markets and Policies in Ukraine[#]

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Abstract. This paper provides an overview of biofuel's markets Ukraine. While Ukraine has great competitive advantage in the production of biofuels based on availability of the feedstock and fertile soils, it does not utilize this opportunity despite the policy goal of decreasing energy dependence on Russian fossil fuels. In the recent years Ukraine was working on fulfilment of European standards in the sector of biofuels. Most importantly, as opposed to Russia, Ukraine has built legislative base which aims to support the industry development and offer large scale of benefits. But due to high excise duty, low oil prices and no penalties for not achieving established indicators, the biofuel industry still stays non-operating.

Key words: Eastern Europe; Biofuels; Ethanol; Biodiesel

JEL classification: R11; Q16; Q42; P28

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Introduction

Due to unique geographical position and the energy dependence, Ukraine plays essential role in European energy market. It became an important gas and oil transportation junction from Russia to Western and Eastern Europe. Since the gaining independence in 1991 Ukraine had gone through recession in the industrial sector, agricultural productivity as well as energy use. Despite the ongoing recovery, some industries still had been in the stage of reconstruction before the annexing the Crimea followed by war. In 2015 industrial production in the country had declined by 21,4% and the whole economy had shrunk dramatically. Meanwhile winter 2015/2016 was the first Ukraine spent without buying Russian gas. Instead it bought gas from Europe, which was by 30% more expensive than Russian (Petro, 2016).

Table 1: Ukraine key indicators 2015

Population (millions)	42.5
GDP (billion 2015 USD)	90.62
Energy production (Mtoe)	63.95
CO2 emissions from fossil-fuel use only (Mt of CO2)	193.19

Ukraine with 42.5 million population consumes around 4.5 mt of gasoline per year. Domestic production of oil and natural gas can provide only 20% of this amount; the rest of consumed gasoline is supplied from neighbour countries or produced from imported oil. This pattern of traditional energy sources consumption is economically unfeasible and risky for energy and national security. Thus the Ukrainian energy infrastructure is defined by low efficiency and high dependence on imported energy sources. Alternative sources of energy would play a significant role in the achievement of energy and gasoline independence. Nowadays as a replacement, on the first place are considered biofuels. And Ukrainian potential for biomass and bioenergy in general is very large.

Table 2: Biofuels in the Balance of TPES in Ukraine

Supply (ktoe)	2008	2009	2010	2011	2012	2013	2014
Liquid biofuels	0	0	0	0	0	60	28
Primary solid biofuels	1711	1624	1666	1763	1738	2155	2383
Export*	-39	-57	-87	-65	-75	-340	-502
Import*						4	25
Biofuels **	1689	1549	1597	1682	1695	1879	1934
Biofuels, % of TPES	1.3%	1.4%	1.2%	1.3%	1.4%	1.6%	1.8%

TPES	134642	114536	132428	126557	122512	116140	105683
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*Export of biofuels relates to solid biofuels, while import to liquid biofuels

**Total primary supply of biofuels taking into account stock changes and net export

Source: IEA, 2016

The country had already become one of the exporters of biofuel feedstock to Europe. Ukraine provides European countries with the rapeseed for biodiesel extraction and wood pellets for electricity and heat supply. Meanwhile EU is lobbying the cultivation of the rapeseed in Ukraine as well as Russian Federation and Kazakhstan. The main reason of import of Ukrainian feedstock stays low labour and energy costs and more fertile land.

Among the former Soviet Union countries Ukraine became the most successful in implementation of the Kyoto Protocol requirements. In 2015 Ukraine submitted the implementation of Intended Nationally Determined Contribution (INDC) under the United Nations Framework Convention on Climate Change. INDC establishes the target to reduce GHG emissions by at least 40% by 2030 in comparison with 1990s levels (940 MtCO_{2e}). However the GHG emissions in Ukraine are forecasted to increase in the nearest future to 533-776 MtCO_{2e} despite the committed INDC level (Climate action tracker, 2015). Therefore Ukraine should revise its energy policy strategies in order to meet the targets, where supportive measures for renewable energy development will make a change. And while the share of biofuels and waste in the total primary energy supply reaches only 2% and policies are under development, the Ukrainian interest in biofuels is slowly increasing (State Statistics Service of Ukraine, 2016).

Feedstock potential

The Ukraine, same as Russia, has huge potential in biomass production, especially for first generation biofuels extraction. Main promising feedstock sources are agricultural commodities, primarily grain and corn for bioethanol, rapeseed, sunflower and soybean for biodiesel. Regarding lignocellulosic biofuels as well as electricity and heat supply, the range of feedstock sources is much larger due to high availability of agricultural residues and by-products.

The volume of biomass energy potential for conventional biofuels varies from year to year, is difficult to forecast and depends mainly on the crops harvest. Gross potential is

estimated on 61 million tons of coal equivalent per year. Meanwhile technical potential reaches 40 million tons and economic potential – 28 million tons. Last five years was especially plentiful for the country in crops production, however growth of biomass energy potential was compensated by the oil prices downturn.

Every year Ukraine utilizes approximately 2 million tons of different kinds of biomass for energy production. Main contribution is made by wood wastes that represent biggest share of 80% in annual biomass consumption. 16% of Ukrainian territory is covered by forest, mainly Carpathians and Polissia regions. Estimated volumes of wood wastes for further processing into biomass include 1.4 million m³ of felling residues, 1.1 million m³ of wood processing waste, and 3.8 million m³ of firewood annually (Geletukha, 2006, 2013).

Table 3: Biomass and biofuel utilization for energy production in Ukraine

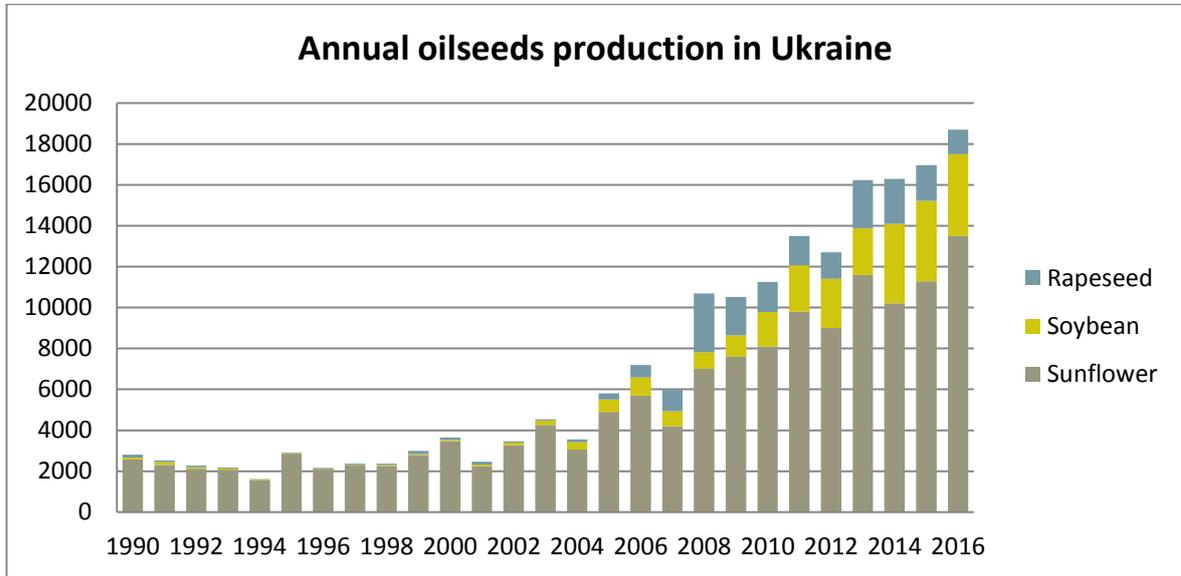
Type of biomass/biofuel	Annual consumption (ktoe)	Usage of economic potential
Straw from grain and rapeseed	43	1%
Biomass from wood	1296	80%
Sunflower husk	343	42%
Bioethanol	53	6.70%
Biodiesel	0	0%

Source: Bioenergy association of Ukraine, 2014

Ukraine is one of the leading producers of grain worldwide and ranked fifth in the corn production with 28.45 mt annually. Domestic corn consumption is considered insignificant since most of it is being exported. Overall Ukraine exports 41% of its gross grain production, meanwhile United States exports 18.5%, China – 0.3% and EU – 9.3%. Taking in account the Ukrainian dependence on imported energy sources and recession in agriculture, exporting of almost half of grain production does not seem to be vital for economy. In opposite, these amounts of exported grain could be used for bioethanol production, contribution to the domestic energy supply and for initial boost of industry's development.

Second potential source of feedstock for bioethanol production is sugar beet and by-products from the sugar production. The sugar beet production had significantly fallen in early 90s due to the lost export relationship after dissolution of Soviet Union. Nowadays, produced volumes of sugar beet cover only the domestic demand. Based on the Ukrainian Scientific Research Institute of Alcohol, from 1 ton of sugar beets could be produced up to 80 – 100 litres

of bioethanol. If the harvest of sugar beet would reach the same level as in 90s, crops, which are not involved in the sugar production, will be as much as 25 million tons. In this regard Ukraine would extract approximately 2 million tons of bioethanol, which is comparable to the Chinese volumes of bioethanol production -2.2 million tons (Kaletnik& Prutska, 2014).



Graph 1: Annual production of crops for biodiesel extraction in Ukraine

Source: United States Department of Agriculture, 2016

Regarding biodiesel: rapeseed, soybean and sunflower are most promising crops for the feedstock. In Ukraine sunflower brings the largest share of the production of oilseeds. However sunflower oilseeds are typical for usage in the food industry and export-oriented, meanwhile rapeseed and soybean could be potentially used for the production of biofuels. The increase in biodiesel demand from abroad has triggered growth of oilseeds production in Ukraine. But almost all yield amounts is being exported to Europe and no industrial production has been established so far. During 2015/2016 season rapeseed prices in Ukraine varied between 10.400-10.600 UAH/mt what is approximately 381 USD/mt (APK-Inform Agency, 2016). At the same time, for instance Hamburg CIF price average for the same period was on 409 USD/mt (USDA, 2016). During seasonal months 2015/2016 from July till April the rapeseed export had reached 1416.5 kt and 1484 kt of soybean had been supplied during September – March to foreign markets (UkrAgroConsult, 2016). Taking into account fact that oil content of soybean and rapeseed is 17–25% and 48–52% respectively, Ukraine could

produce about 1070 tons of crop oil that would fully cover the agricultural needs in biodiesel (Kaletnik & Prutska, 2014).

Ukrainian incentives on biofuels market

Energy strategies

Energy Strategy of Ukraine is a political document, which specifies the purpose and application of Ukrainian energy policy in the long term horizon along with procedures of its implementation. The strategy aims to address public efforts into fulfilment of targets for entire energy sector including renewables. According to the recent Energy Strategies, the main priority of the Ukrainian energy sector is support of energy security and ambition for European integration.

Energy Strategy of Ukraine until 2030

First edition of Energy Strategy of Ukraine for the period till 2030 had been adopted in March 2006. The document provides targets for the development of renewable energy production, which seem to be underestimated compared to analysed potential of bioenergy in Ukraine. Basic scenario of the strategy proposes significant growth in the energy consumption by 25% along with the increase in power consumption by 55% until 2030 compared to 2010. These key indicators are not considered as supportive for energy efficiency and security by saving non-renewable energy resources.

Later the document was revised due to the obsolete targets and trends, but mainly because it was not in line with the National Renewable Energy Action Plan (NREAP). In 2013 Cabinet of Ministers signed new Energy Strategy until 2030. Strategy proposes objects for biomass utilization in electricity generation that should reach 2.4% from the total renewable electricity and only 0.1% from the total electricity produced in Ukraine. Meanwhile it does not cover the usage of biomass in heat supply. The sector of liquid biofuels is the only sector of bioenergy, development of which is described in the document. One third of 33.7 billion m³ (in 2015) of consumed natural gas is necessary to be replaced by biofuels. In the baseline scenario the shift to the usage of gasoline containing 10% bioethanol until 2020 and 15% - by 2030 is planned. According to the ES, the expansion of biodiesel as motor fuel happens after 2020. Further up to 2030, will be made a transition to use of biofuels with 7% of biodiesel.

Table 4: Biodiesel and bioethanol development in the Energy Strategy until 2030

	2010	2015	2020	2025	2030
Bioethanol consumption, million tons	< 0.11	0.3	0.6	0.8	1.1
Biodiesel consumption, million tons	0	0	< 0.1	0.3	0.8
Total consumption of biofuels	< 0.1	0.3	0.6	1.1	1.9
Share of biofuels in motor fuels consumption (%)	< 1	2.5	4.5	7.2	10.9

Source: Energy Strategy of Ukraine until 2030, 2013.

Total investments estimated for implementation of the strategy increased by 5% in comparison with the previous version of the strategy and reach 1.821 trillion UAH (71 billion USD in the 2016 prices). Approximately 7% from these funds are planned to address for the development of RES. Meanwhile the evolution of renewable energy sector will take place while competing with the traditional sources.

According to Bioenergy Association of Ukraine the development areas and targets proposed in the new Energy Strategy until 2030 are opposite to trends in the energy sectors of leading countries. Taking into account the fact that Ukraine is willing to become a member of EU, its actions and policies do not complement the EU strategy in the sphere of renewables. Moreover Ukraine basically envisages a scenario leading to the stagnation of the renewable energy sector. Based on the 2014 year data, Ukrainian share of biofuels in the final energy consumption in the industry of transport is 0.3%. In comparison, average share of renewable energy sources in transport fuel consumption across the EU-28 was 5.9 % in 2014 (IEA, 2016).

Energy Strategy is the document that should be reviewed every five years and updated taking regarding new trends and opportunities. In order to improve current situation in the sector of renewables, two drafts of the new Energy Strategy until 2035 had been developed.

Energy Strategy of Ukraine until 2035

First version of the new strategy was approved in 2015 by National Institute for Strategic Research and key figures were confirmed with NREAP. Nonetheless the document includes growth in gross final energy consumption by 12.6% by 2035 in comparison with 2013, what is not coordinated with the general European trend of minimising the energy consumption. Updated Energy Strategy proposes an optimisation of the country's energy

balance by increase in share of renewable energy up to 11% in 2020 and to 20% by 2035. Table below shows projected energy balance, including development of renewable energy sources share in the new version of Energy Strategy until 2035.

Table 5: Projected balance of fuel and energy sources until 2035

Consumption, Mtoe	2013	2020	2025	2030	2035
Coal	41.4	37.69	38.37	37.27	33.78
Natural gas	39.5	37.33	33.57	33.2	34.17
Oil products	9.85	13.97	14.86	15.74	16.48
Nuclear power	21.9	25.31	25.38	27.39	32.86
Biomass, biofuel and waste	1.56	6.38	8.91	11.85	13.1
Solar energy	0.07	0.37	0.56	0.7	0.84
Wind energy	0.08	0.21	0.32	0.43	0.54
Hydraulic power	1.14	0.93	1.02	1.21	1.25
Ambient power	0.05	0.78	1.42	1.86	2.4
Net export	-	-1.03	-1.29	-2.15	-2.58
Total	115.55	121.94	123.12	127.5	132.84
including RES	2.9	8.67	12.23	16.05	18.13
Gross final consumption (TFC)	69.56	78.89	80.84	85.13	88.91
The share of RES in TFC, %	4.5	11	15.1	18.9	20.4

Source: Draft of Energy Strategy of Ukraine until 2035, 2015.

The ES pays more attention to the second generation biofuels and envisages growth in the share of biofuels usage in the transport market. One of the tasks of the strategy is to establish technical requirements to the production and utilization of biofuels and put into force mandatory requirements regarding the usage of advanced biofuels in vehicles. According to the Table 9, forecasted gross final consumption of biofuels and wastes will reach 4909 ktoe, only 4.5% of which will be used in transportation, 9.3% in agriculture, 6.9% in food industry and around 77% by population.

Table 6: Targeted supply and consumption of biofuels and waste in 2035

Supply and consumption, thousands tons of o.e. (ktoe)	Biofuel and waste
Production	13100
Gross final consumption	4909
Industry including	403
Food industry	343
Other industrial sectors	60
Transport	223
Agriculture	459
Services and other consumers	52
Population	3772

Source: Draft of Energy Strategy of Ukraine until 2035

Second draft of the document was named New Energy Strategy of Ukraine and it was proposed by Razumkov Centre in collaboration with the National Institute for Strategic Research attached to President of Ukraine and other key NGOs and research institutions of Ukraine. The main difference of this Energy Strategy is that in the opposite to the first document, it plans decrease of the consumption of primary energy from 115.2 Mtoe in 2013 to 102.6 Mtoe in 2035, which is following general trend of energy efficiency rise.

Both versions of ES are currently sent for approval from state agencies. The Energy Strategy until 2035 was planned to be signed already in 2014, however due to low oil prices environment and ongoing war, its examination was postponed indefinitely.

Investment programs

Even before the main supportive legislation for biofuels had been developed, the government had approved “Ethanol” program in early 2000 followed by technical documents on bioethanol blends. Based on the program, production of bioethanol was established in the number of branches of state enterprise “Ukrspirt”. During development stage, testing and further implementation from 1998 till 2004, “Ukrspirt” entities had produced approximately 54 thousand tons of bioethanol. However, because of the lack of legislative support and mandatory blends, along with the increase in prices of feedstock, production of bioethanol had been temporary stopped in 2005.

In 2005 the Cabinet of Ministers had approved the Program to develop biodiesel production. The program envisages that Ukrainian production and consumption of biofuels

will grow approximately to 520 000 tonnes in 2010. According to the program rapeseed production in 2009 should increase to 6.6 million tons and 7.5 million tons in 2010. Whilst the maximum, rapeseed production had ever reached, was 2.9 million tons in 2008 (see Graph 5 above). Thus the production forecast of the program was based on the inadequate assumptions. As reported by USDA: the program introduces very general and unclear methods to attain established targets and does not provide biodiesel producers with benefits. In this regard the implementation of Program to develop biodiesel production has had insignificant impact on the Ukrainian biofuel industry.

Legislation in the Ukrainian sphere of biofuels

As a member of Energy Community Treaty, on a voluntary basis Ukraine had implemented EU directives on biofuels and other RES for transport (2003/30/EC). An important step in the direction of biofuels development had been adoption of law "On stimulation of production of biological fuels" in 2008. For the first time in the history of independent Ukraine the law states that biofuels could be produced by any business entity. Before its ratification the only legal producer of biofuel was "Ukrspirit" as a state monopolist. Following year the law "On alternative fuels" had been adopted. This law defines legal, social, economic, environmental and organizational principles of production and extraction of alternative fuels, as well as stimulating an increase of their share up to 20% from the total volume of fuel consumption in Ukraine until 2020. Based on the new legislation, all Ukrainian suppliers producing biofuels for selling have to be certified. And all economic subjects that are operating in production, storage and selling liquid types of biofuels and biogas need to be included in the state register.

Government of Ukraine is encouraging investments into the development of biofuel facilities by offering benefits not only to producers but also to consumers. In the following years Cabinet of Ministers had approved number of tax related incentives in the biofuel industry:

Corporate Profit Tax

In 2009 year president of Ukraine signed a law "About amendments to some laws of Ukraine on facilitating the production and use of biofuels". The significant stimulating effect of which became the temporary cancellation of corporate profit tax related up to 80% of the profits from the heat and electricity production from biofuels, materials and components which

will be used in production, along with production and services in transport and equipment related to renewable energy. The law came into force in 2010 year and it was supposed be in force for ten years. The law requires usage of freed up funds to lower production costs of the entity.

In addition the law encourages not only the producer but also the consumer. In particular bonus depreciation provided for the period until year 2019 related to equipment operating or/and producing biofuels. In this regard in the first reporting period the depreciation of 50% from the book value is allowed. Individuals, who have bought or converted their car's engines for usage of biofuels, can use this tax benefit for the payment of income tax.

Value added tax (VAT) and import customs duties

According to the Tax Code, imports of the certain types of machinery and materials related to alternative types of fuels into Ukraine are exempt from VAT as well as custom duties. Nonetheless, only small number of companies had received exemption from VAT due to lack of transparency in the procedure (Sysoievis & Cherniavskiy, 2013).

Land tax and leasing

Tax reduction is applicable to the land used for RE facilities; it includes 25% of the standard rate and 3% from the annual lease payment value (standard rate reaches 12%) for state and municipal lands.

Law on Alternative Fuels

Next step in biofuel support policies made by the Ukrainian Parliament had been an adoption of law "On introduction of changes to certain laws of Ukraine regarding the production and use of motor fuels containing biocomponents" in 2012, which brought amendments in the law "On alternative fuels" accordingly to the slow increase in production and use of biofuels in motor fuel mix. The law envisages that minimum recommended rate of bioethanol, contained in motor fuels, produced or imported to Ukraine, should reach at least 5% in 2013. In 2014 – 2015 the minimum had become mandatory and gradually achieve minimum of 7% in 2016.

However mandatory rates were not tolerable to engines, which are not suitable for the usage of biofuel blends and require modification. As a result the Ministry of Energy and Coal Industry of Ukraine had developed new draft of "On changes to the article 2 of the Law "On

Alternative Fuels” that decreases obligatory rates of bioethanol in 2014 to the 3% minimum and cap of 5%. For 2016 minimum mandatory rate shall be 5% and not exceed 10%. But as reported by Energy Reforms Coalition in 2014:

“In reality, general transition to bio-fuel has not taken place due to gaps in legal regulation of production, storing and selling of alternative fuel”.

Standardisation of biofuels

State standard of Ukraine (DSTU) №4841 and DSTU №6081 were developed already in 2007 and 2009 respectively. The standards introduce quality requirements for the biodiesel and the gasoline blends with biodiesel. However there is no authority yet, who would issue the approval of fulfilled standards, and the ratification process is not confirmed. Regarding bioethanol, DSTU №4839 for bioethanol blends had been approved earlier in 2007. Nonetheless it sets maximum volume of bioethanol content on 5%, what was not coordinated with changes in mandatory rate for 2014 and therefore was revised in the same year. Separate DSTU №7166 signed in 2010 introduces technical conditions for bioethanol.

Feed-in Tariff

In 2009 first efficient program “The Green Tariff” had come into force, which represents feed-in tariff scheme for electricity produced from all kinds of RES, including biofuels. The tariff allows government, on behalf of state enterprise “Energorynok”, to buy electricity generated from RES from commercial entities and individuals. Meanwhile the enterprise is obliged to purchase offered amount of electricity produced from RES from subjects for whom the ‘green’ tariff is established. The adopted program is developed for the period until 2030. Thanks to this policy, economic objects do not have to pay for the electricity but also sell the excess to the government. According to the National Commission of State Regulation in the Sphere of Energy, by May 2014 green tariff had been received by 5 companies, producing electricity from biomass and 5 entities operating on biogas.

Excise duty

In 2013 the government introduced the separate excise duty for alternative fuels with minimum 5% of bioethanol and biodiesel. The main argument in favour of these changes was an increase in the state revenues, as well as elimination of schemes for tax evasion in the production of alternative fuels. The amendment in the tax policy settled up price of traditional

fuel and biodiesel, ever since Ukrainian biodiesel production is zero (lastly in 2012 318 tonnes of biodiesel was produced). Regarding bioethanol blends with gasoline, the excise tax rate was established at 50% from the standard rate of gasoline and reached 99 EUR/t, what had initiated break in the bioethanol industry.

Further in 2015 another powerful change in the Tax Policy was approved, which set back the progress in Ukrainian biofuel market to the early stage of development. Parliament had raised excise tax on motor fuels and differentiated two tax rates for bioethanol blends. In case of biofuels with minimum 5% of bioethanol excise duty had increased by 42% from 99 EUR/t to 141 EUR/t (70% from the standard rate). Besides for alternative fuels with higher levels of bioethanol (minimum 30%) was introduced tax rate of 50% from the new gasoline rate (114 EUR/t). The excise tax increase for traditional motor fuels was accepted only for half a year, whereas for alternative fuels – on a permanent basis. As confirmed by director of Ukrainian association of alternative fuels producers "Ukrbiopalivo" Taras Nikolaenko, due to amendments in the Tax Code, all of bioethanol plants had stopped their production. Because of the downturn in oil prices and increase of excise tax, production of biofuel in Ukraine became disadvantageous. The association is now dealing with the implementation of requirements based on the signed Directive 2009/28/EC and the employment of European excise law, which claims the production of fuels that reduce emissions, should be taxed at a preferential regime.

Further amendments in the law “On alternative fuels” were made recently in 2016. Previous version of the law required economic entities, which are engaged in the sphere of biofuels, be included in the state register of biofuel producers in the manner prescribed by the Cabinet of Ministers of Ukraine. New amendments cancel this condition and notably simplify doing business in the production of biofuels.

International collaboration

In 2012 Ukraine had been cooperating with China in arranging of biofuel production. The collaboration consisted of exchange of obsolete machinery in the number of unprofitable alcohol plants and conversion their business line into bioethanol production. Later in spring of 2013 Ukrainian Ministry of Agriculture and Finland had agreed on partnership in alternative fuel sources industry. Especially Ukraine was interested in bringing Finnish know how to production of biofuels and internship of Ukrainian experts regarding latest technologies in

energy saving (Ministry of Agrarian Policy and Food 2013). Ukrainian international cooperation is rather stronger in the feedstock production as compared to biofuels (Schaffartzik, 2013). This is explained by responsibilities of Ukraine regarding Renewable Energy Directive that liquid biofuels should comply with standards of sustainability, which are mainly feedstock based. Before all else Germany supported Ukraine in the crop production for years through project of German Society for International Cooperation, seminars and biofuel conferences, which were part of German-Ukrainian Agricultural Dialogue (IER, 2010; APD, 2013).

Association of bioethanol producers in Ukraine

To promote development in production of alternative motor fuels in 2012 “Ukrbiopalivo” – an Association of Producers of Alternative Fuels was founded. It consists of ten distilleries, which belong to state enterprise “Ukrspirt”, and three private companies. The association took part in developing of mandatory blends of 5-7% of bioethanol in gasoline and nowadays strive on changes in the current Excise Tax Policy.

Excise tax rate for bioethanol blends with gasoline that came into force in 2014, led to the suspension of eleven distilleries in the same year. With existing excise tax Ukrainian biofuels became non-competitive with the traditional imported fuels. Currently, out of thirteen entities, only one private company “Eko-energiya” is operating, capacity of which is 1500 tons per month.

Conclusions

Ukrainian energy sector is most challenged sector in the country, which is built mainly based on the interests of oligarchs and lobbyists related to the conventional fuel production (Malygina, 2013). Therefore Ukraine does neither produce nor consume biofuels in the relevant volumes. Whereas country disadvantageously exports feedstock to Europe for cheaper price and purchase expensive gas and oil instead. Despite all mentioned, Ukraine has great competitive advantage in the production of biofuels as availability of the feedstock, fertile soils and support through investments and know-how from abroad. Thus national interest should be a shift from export of raw material to processing them into final biofuel products. Based on the experience of leading countries in the biofuels market, Ukraine should overcome energy dependence through establishment of biofuel production and its utilization within the country.

In the recent years Ukraine was working on fulfilment of European standards in the sector of biofuels. Most importantly, as opposed to Russia, Ukraine has built legislative base which aims to support the industry development and offer large scale of benefits. But due to high excise duty, low oil prices and no penalties for not achieving established indicators, the biofuel industry currently stays non-operating.

According to Ukrainian Association of producers of alternative fuels, main barriers that hinder Ukrainian biofuel industry from rise are as follows:

- High rate of excise duty that made production of biofuel non-competitive to traditional motor fuels. Because of the Tax Code amendments, production of biodiesel had stopped already in 2013 and 13 bioethanol distilleries suspended their operation in the following years;
- Highly corrupted process of regulation of bioethanol production and fulfilment of standard technical requirements.

Recently Ministry of Agriculture had developed bill for a change of excise duty to zero rate and sent it to the Cabinet to consider. As soon as the amendment comes into force, the bioethanol demand is expected to rise up to 215 - 300 thousand tons. Meanwhile annual Ukrainian bioethanol production capacity reaches maximum level at 25% of the demand (Kalnitskaya, 2013). But so far Ministry of Agriculture in cooperation with “Ukrbiopalivo” plan to focus on bringing national standards of legislation in line with EU norms, simplify regulation of bioethanol production and replace mandatory bioethanol blends by economic incentives.

List of references

APD German-Ukrainian Agricultural Policy Dialogue, 2016. [online]. *IAMO*. [cit. 2016-09-14]. Available at: <https://www.iamo.de/en/research/projects/details/apd/>.

Arbuzov, S., 2013. This year agrarian sector can become the leader taking into account investment volumes. [online]. *Press service of first vice prime minister*. [cit. 2016-08-14]. Available at: <https://forua.wordpress.com/2013/06/04/arbuzov-agricultural-sector-can-become-leader-in-volumes-of-investments/>.

Bari D., 2014. *Bio-based chemical industry: Challenges and opportunities*. IHS Blogs. [cit. 2016-08-28]. Available at: <http://blog.ihs.com/q12-bio-based-chemical-industry-challenges-and-opportunities>

Barros S., 2015. *Brazil: Biofuels Annual: Biofuels - Ethanol and Biodiesel* [online]. USDA Foreign Agricultural Service: GAIN. [cit. 2017-08-3].

Blanco M., Adenauer M., Shrestha S., Becker A., 2013. *Methodology to assess EU Biofuel Policies: The CAPRI Approach* [online]. European Commission: Joint Research Centre. [cit. 2017-07-20]. ISSN 1831-9424. Available at: <http://ftp.jrc.es/EURdoc/JRC80037.pdf>

Bland A., 2015. *Conventional biofuels: a busted flush* [online]. IHS Markit, [cit. 2016-08-29]. Available at: <http://blog.ihs.com/q22-video:-conventional-biofuels-a-busted-flush>

BP Statistical Review of World Energy, 2015. [online] , [cit. 2016-08-29] Available at: bp.com/statisticalreview

Chakraborty A., 2008. *The global food crises* [online]. Food and Agriculture Organization of the United Nations [cit. 2016-08-18]. Available at: <http://www.un.org/esa/socdev/rwss/docs/2011/chapter4.pdf>

Climate Action Tracker: Ukraine. [online] Available at:
<http://climateactiontracker.org/countries/developed/ukraine.html>.

De Gorter, Just H. , 2008. “Water” in the U.S. Ethanol Tax Credit and Mandate: Implications for Rectangular Deadweight Costs and the Corn-Oil Price Relationship [online]. Department of Applied Economics and Management, Cornell University.

Doku A., Di falco S., 2012. Biofuels in developing countries: Are comparative advantages enough? *Energy Policy* 44 101–117 [online]. [cit. 2016-11-23].

Eight Joint EU-Ukraine. (2016). [online]. *European Commission*. [cit. 2016-08-21]. Available at:
https://ec.europa.eu/energy/sites/ener/files/documents/20140320_mou_progress_report8_en.pdf

Environmental consequences of the Chernobyl accident and their remediation: twenty years of experience, 2006. Report of the UN Chernobyl Forum Expert Group 'Environment' (EGE). *Atomic Energy Agency* [online]. [cit. 2016-12-15]. ISSN 1020-6566. Available at:
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1239_web.pdf

European Renewable Ethanol: State of the industry 2015 [online]. ePure, 2015 [cit. 2017-07-5]. Available at: http://epure.org/media/1215/epure_state_industry2015_web.pdf

Farkov A., 2016. Bez Nefti. *Amic* [online]. [cit. 2016-9-28]. Available at:
<http://www.amic.ru/news/320494/>

Geletukha, G, Zeleznaya T., 2012. Mesto bioenergetiky v projekte obnovlennoj energeticheskoj strategii Ukrainy do 2030 goda. [online]. UABIO. [cit. 2016-08-15]. Available at: http://www.journal.esco.co.ua/industry/2013_5/art127_1.pdf

Geletukha, G, et. al., 2015. Analyses of energy strategies of EU and world countries and role of renewables in their energy systems. [online]. *Bioenergy Association of Ukraine*. [cit. 2016-09-2]. Available at: <http://uabio.org/en/activity/uabio-articles/3075-bioenergy-strategies-part-2>

Geletukha, G. (2012) Nuzen li Ukraine biogas? [online] *Obozrevatel*. [cit. 2016-09-3]. Available at: <http://obozrevatel.com/author-column/73812-nuzhen-li-ukraine-biogaz.htm>

Geletukha, G., et. al., 2006. Overview on Renewable Energy in Agriculture and Forestry in Ukraine . [online]. *German – Ukrainian Agricultural Policy Dialogue*. [cit. 2016-09-6]. Available at: http://www.ier.com.ua/files/publications/Policy_papers/Agriculture_dialogue/2006/AgPP6_en.pdf

GIZ. Ukraine, 2016. [online] [cit. 2016-09-21]. Available at: <https://www.giz.de/en/worldwide/302.html> .

Global trends in renewable energy investment 2016 [online]. Frankfurt School-UNEP Centre/BNEF. [cit. 2016-08-28]. Available at: http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment2016lowres_0.pdf

Greenfield Creditors Group, 2016. [online]. [cit. 2016-10-21]. Available at: <https://greenfieldcreditorsgroup.wordpress.com/>

Intended Nationally Determined Contribution (INDC) of Ukraine to a New Global Climate Agreement, 2016. [online]. [cit. 2016-09-21]. Available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Ukraine/1/150930_Ukraine_INDC.pdf.

International Energy Outlook 2016. *U.S. Energy Information Administration (EIA)* [online]. 2016, s. 290 [cit. 2016-05-14]. Available at: <http://www.eia.gov/outlooks/ieo>

International Energy Statistics: Biofuels Production [online]. Renewable Fuels Association, 2016 [cit. 2017-08-1]. Available at: <http://www.afdc.energy.gov/data/10331>

Joffe M., 2011. Problemy razvitija biotoplivnoj otrasli [online]. *Gomel State Technical University* [cit. 2016-07-2]. Available at: <https://elib.gstu.by>

Kaletnik G., Prutska O., Pryshliak N., 2014. Resource potential of bioethanol and biodiesel production in Ukraine. *Visegrad Journal on Bioeconomy and Sustainable Development* [online]. [cit. 2016-10-12]. DOI: 10.2478/vjbsd-2014-0002. ISSN 1339-3367. Available at: <http://www.degruyter.com/view/j/vjbsd.2014.3.issue-1/vjbsd-2014-0002/vjbsd-2014-0002.xml>

Kalnitskaya J., 2013. Business opportunities in the bio-based economy in Ukraine [online]. *ProMarketing Ukraine*, 2013 [cit. 2016-10-19]. Available at: <http://www.biobasedeconomy.nl/wp-content/uploads/2011/08/BBE-Ukraine-study-2013-12-13.pdf>

Kantamanemi, R.(2014), Executive Summary of Evaluation. *International Finance Corporation*. [online]. [cit. 2017-01-12]. Available at: <http://www.ifc.org/wps/wcm/connect/ced716804602cb75adf6bd9916182e35/Terminal+Evaluation+of+RSEFP.pdf?MOD=AJPERES>

Katona, V., 2016. Realizing Russia's renewable energy potential in 2017. *Russia Direct*. [online]. [cit. 2016-08-29]. Available at: <http://www.russia-direct.org/opinion/realizing-russias-renewable-energy-potential-2017>

Key Renewables Trends Excerpt form : Renewables information, 2016. *International Energy Agency*. [online]. [cit. 2016-05-14]. Available at: <https://www.iea.org/publications/freepublications/publication/KeyRenewablesTrends.pdf>

Lane, J. Biofuels Mandates Around the World: 2016. *Biofuels Digest* [online]. 2016 [cit. 2016-06-29]. Available at: <http://www.biofuelsdigest.com/bdigest/2016/01/03/biofuels-mandates-around-the-world-2016/>

Malygina, K., 2013. The oligarchization of the Ukrainian energy sector under Victor Yanukovyts 2010- 2012. [cit. 2016-10-12] *UkraineAnalysen* 112, 2-6.

Medvedkova I., Trudayeva, T., 2013. Biofuel market: problems and prospects. *Mosty*, vol. 6, no. 3.

Ministry of Agrarian Policy and Food [online]. [cit. 2016-10-12]. Available at: <http://minagro.gov.ua/en/node/5529>

Minnesota Biodiesel Program. *Minnesota Department of Agriculture* [online]. [cit. 2016-07-28] Available at: <http://www.mda.state.mn.us/renewable/biodiesel/aboutbiodiesel.aspx>

Neft Urals, 2016 *Minprom: Informational Agency* [online]. [cit. 2017-01-12]. Available at: <http://minprom.ua/news/205190.html>

O’Kray C., Wu K., 2010. *Biofuels in China: Development Dynamics, Policy Imperatives, and Future Growth* [online]. International Association for Energy Economics [cit. 2016-08-28]

Oilseeds: world markets and trade. *USDA* [online]. 2017 [cit. 2017-1-1]. Available at: <http://usda.mannlib.cornell.edu/usda/current/oilseed-trade/oilseed-trade-01-12-2017.pdf>

Osterkorn M., Lemaire X., Emerging market for Green Certificates. *United Nations: Sustainable development knowledge platform* [online]. 2008 [cit. 2017-07-3]. Available at: http://www.un.org/esa/sustdev/csd/csd15/lc/reep_emgc.pdf

Overview on Renewable Energy in Agriculture and Forestry in Ukraine, 2010 [online]. The Institute for Economic Research and Policy Consulting (IER) [cit. 2016-10-13]. Available at: http://www.ier.com.ua/ua/institute/about_institute

Patni N., Shibu G. Pillaji , Dwivedi A. Wheat as a Promising Substitute of Corn for Bioethanol Production, *Procedia Engineering*, Volume 51, 2013, Pages 355-362

Petro N., 2016. Why Ukraine needs Russia more than ever. *The Guardian*. [online]. [cit. 2016-09-25]. Available at: <https://www.theguardian.com/world/2016/mar/09/ukraine-needs-russia-nicolai-petro>

Pochemu Ukraina ne pochuvstvovala padenie mirovych cen na neft, 2016. [online] The Kiev times. [cit. 2016-09-10] Available at: <http://thekievtimes.ua/economics/462068-pochemu-ukraina-ne-pochuvstvovala-padenie-mirovych-cen-na-neft.html>

Policies and measures: Ukraine. Green Tariff (Feed-in Tariff).2009. [online] *International Energy Agency*. [cit. 2016-09-17]. Available at: <http://www.iea.org/policiesandmeasures/pams/ukraine/name-38470-en.php> .

Pouliot S., Babcock B. 2015, *How Much Ethanol Can Be Consumed in E85?* [online]. Center for Agricultural and Rural Development Iowa State University, [cit. 2016-06-21]. Available at: http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1050&context=card_briefingpapers

Rahu M. Health effects of the Chernobyl accident: fears, rumours and the truth. *European Journal of Cancer* 2003;39:295–9.

Rajagopal D., Zilberman D., 2007. Review of environmental, economic and policy aspects of biofuels. *Policy Research Working Paper 4341*, The World Bank.

Renewable Energy: Medium-Term Market Report 2015: Market Analysis and Forecasts to 2020 [online]. IEA. [cit. 2016-08-20]. Available at: <https://www.iea.org/Textbase/npsum/MTrenew2015sum.pdf>

Renewable ethanol: driving jobs, growth and innovation throughout Europe: State of the Industry Report [online]. ePure, 2014 [cit. 2016-06-22].

Renewables 2015. Global Status report. *Renewable Energy Policy Network for the 21st century* [online]. 2015, s. 251 [cit. 2016-05-20]. Available at: http://www.ren21.net/wp-content/uploads/2015/07/REN12-GSR2015_Onlinebook_low1.pdf

Schaffartzik A., Plank C., Brad A., 2014. Ukraine and the great biofuel potential? A political material flow analysis. *Visegrad Journal on Bioeconomy and Sustainable Development* [online]. [cit. 2016-10-12]. DOI: 10.1016/j.ecolecon.2014.04.026. ISBN 10.1016/j.ecolecon.2014.04.026. ISSN 1339-3367. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0921800914001438>

Schmetz E, Ackiewicz M, Tomlinson G, White C, Gray D, 2009; “Increasing Security and Reducing Carbon Emissions of the U.S. Transportation Sector: A Transformational Role for Coal with Biomass”, *National Energy Technology Laboratory*

SEC "Biomass", 2013. [online] *Scientific Engineering Centre “Biomass”*. [cit. 2016-10-3]. Available at: <http://biomass.kiev.ua/en/>.

Shrestha, D., 2012, Feedstock Yields and Prices for Biodiesel. [online] *eXtension.org* [cit. 2016-12-2]. Available at: <http://articles.extension.org/pages/54946/feedstock-yields-and-prices-for-biodiesel>

State Statistics Service of Ukraine [online]. [cit. 2016-11-1]. Available at: <http://www.ukrstat.gov.ua/>

Su Y., Zhang P., 2015. An overview of biofuels policies and industrialization in the major biofuel producing countries. *Renewable and Sustainable Energy Reviews* 50 (2015) 991–1003 [online] [cit. 2016-08-14].

Sysoievis M., Cheriavskiy L., 2013. Legislative scheme of support for the renewable energy sector in Ukraine. [online] *Financier Worldwide*. [cit. 2016-11-28]. Available at: <https://www.financierworldwide.com/legislative-scheme-of-support-for-the-renewable-energy-sector-in-ukraine/>

The 6th International Specialized Exhibition, 2013. [online] [cit. 2016-09-1]. Available at: http://www.biofuel.agro-expo.com/BioFuel_Press_News.htm.

The largest producers of CO2 emissions worldwide in 2016, based on their share of global CO2 emissions [online]. STATISTA. The Statistics Portal, 2016 [cit. 2017-06-16]. Available at: <http://www.statista.com/statistics/271748/the-largest-emitters-of-co2-in-the-world/>

The situation of export market of rapeseed in Ukraine and its products on the eve of the new season ,2016. [online] *Agro2b*. [cit. 2016-11-3]. Available at: <http://agro2b.ru/en/analytics/32343-Sostoyanie-eksportnogo-rynka-rapsa-Ukraine-produktov.html>

Trends in global CO2 emissions 2015 Report [online]. PBL Netherlands Environmental Assessment Agency, 2015 [cit. 2016-08-29]. Available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2015-trends-in-global-co2-emissions-2015-report-98184.pdf

Tullo, A., 2016. *BP Will Exit Cellulosic Fuels*. Chemical & Engineering News. [online] *Cen.acs.org*. [cit. 2016-08-29]. Available at: <http://cen.acs.org/articles/92/i50/BP-Exit-Cellulosic-Fuels.html?type=paidArticleContent>

Uglublennyj obzor polityky i program v sfere energoeffektivnosti, 2010. *Sekretariat Energeticheskoy Hartii* [online]. [cit. 2016-11-12]. Available at: http://belgium.mfa.gov.by/docs/belarus_ee_2013_rus.pdf

UkrAgroConsult: Analytical center of Ukraine for the agricultural sector [online]. [cit. 2017-09-15]. Available at: <http://www.ukragroconsult.com/>

Ukraine not to face high prices for rapeseed - expert, 2016 [online]. [cit. 2016-12-3]. Available at: <http://www.apk-inform.com/en/agencynews/1071068#.WHhUUfnhDIU>

Ukraine. *Green Tariff (Feed-in Tariff)*, 2009. Available at: <http://www.iea.org/policiesandmeasures/pams/ukraine/name-38470-en.php>

Ukraine: Energy Balances for 2014. *IEA* [online]. [cit. 2016-11-12]. Available at: <http://www.iea.org/statistics/statisticssearch/report/?year=2014&country=UKRAINE&product=Balances>

Ukrbiopalivo: Ukrainian Association of producers of alternative fuels [online]. [cit. 2017-01-12]. Available at: <http://ukrfuel.org/>

Vierhout, R. EU's Struggle for E10. *Ethanol Producer Magazine* [online]. 2014 [cit. 2016-06-21]. Available at: <http://www.ethanolproducer.com/articles/10797/euundefineds-struggle-for-e10>

What is energy security? *International Energy Agency* [online]. [cit. 2016-04-11]. Available at: <https://www.iea.org/topics/energysecurity/subtopics/whatisenergysecurity/>

World Bank Helps Belarus with Modernization of Energy Sector, 2014. World Bank [online] [cit. 2016-12-17]. Available at: <http://www.worldbank.org/en/news/press-release/2014/03/31/world-bank-belarus-energy-sector>

Zelenyj tarif v Ukraine, 2016. [online] *Solar Battery* [cit. 2016-10-1]. Available at: <http://www.solar-battery.com.ua/zeleniy-tarif-v-ukraine/>

Ziolkowska J., Simon L., 2011."Biomass Ethanol Production Faces Challenges." ARE Update 14(6): 5-8. University of California Giannini Foundation of Agricultural Economics.

Energy Strategies and legislation documents

EU. *Directive 2003/30/EC*. European Commission, 2003. Available at: <http://www.ery.cz/en/-/directive-2009-28-ec>

EU. *Energy Strategy 2030* (2016). *European Commission*. Available at: <https://ec.europa.eu/energy/node/163>

EU. *Directive 2003/30/EC of the European Parliament*. 2003. Available at: <http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32003L0030>

Ukraine. *Energy Strategy of Ukraine until 2030*, 2006. Available at: <http://mpe.kmu.gov.ua/minugol/control/uk/doccatalog/list?currDir=50358>

Ukraine. *Energy Strategy of Ukraine until 2035*, 2015. Available at: <http://mpe.kmu.gov.ua/minugol/control/uk/doccatalog/list?currDir=50358>

Ukraine. *Law “About amendments to some laws of Ukraine on facilitating the production and use of biofuels”*. 2009. Available at: <http://zakon2.rada.gov.ua/laws/show/1391-17?test=4/UMfPEGznhhoEl.ZicllKVjHI4B.s80msh8Ie6>

Ukraine. *Law “On alternative fuels”*, 2008. Available at: <http://uazakon.ru/zakon/zakon-ob-alternativnih-istochnikah-energii.html>