

Artículo de investigación

Ways of improving environmental management through the introduction of biofuel products in the russian economy

Formas de mejorar la gestión ambiental a través de la introducción de productos biocombustibles en la economía rusa

Modos de melhorar a gestão ambiental através da introdução de produtos biocombustíveis na economia da russa

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Abstract

Environmental management plays a central role in the social and economic development of today's world. Its key problems can be solved by using more effective methods of encouraging economic entities to find the most effective ways of introducing biofuel products in their production cycle. The article discusses these ways and methods and justifies the strategy of increasing biofuels production in Russian regions. The structure and algorithms of building a new green economy in Russia are revealed, and economic risks and opportunities for the biofuel products introduction are identified within the framework of the improvement of national environmental management efficiency. In our study we have used the analytical, expert and system-economic research methods.

Resumen

La gestión ambiental juega un papel central en el desarrollo social y económico del mundo de hoy. Sus problemas clave pueden resolverse utilizando métodos más efectivos para alentar a las entidades económicas a encontrar las formas más efectivas de introducir productos de biocombustibles en su ciclo de producción. El artículo analiza estas formas y métodos y justifica la estrategia de aumentar la producción de biocombustibles en las regiones rusas. Se revelan la estructura y los algoritmos de construcción de una nueva economía verde en Rusia, y se identifican riesgos y oportunidades económicas para la introducción de productos de biocombustibles en el marco de la mejora en la eficiencia de la gestión ambiental nacional. En nuestro estudio, hemos utilizado los métodos de

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Key words: biofuel, green economy, bioethanol, green energy, environmental management.

investigación analítica, experta y económica del sistema.

Palabras clave: biocombustible, economía verde, bioetanol, energía verde, gestión ambiental.

Resumo

A gestão ambiental desempenha um papel central no desenvolvimento social e econômico do mundo atual. Seus principais problemas podem ser resolvidos usando métodos mais eficazes para incentivar entidades econômicas a encontrar as formas mais eficazes de introduzir produtos de biocombustíveis em seu ciclo de produção. O artigo analisa essas formas e métodos e justifica a estratégia de aumentar a produção de biocombustíveis nas regiões russas. A estrutura e os algoritmos para a construção de uma nova economia verde na Rússia são revelados, e riscos econômicos e oportunidades para a introdução de produtos de biocombustíveis são identificados no âmbito da melhoria da eficiência da gestão ambiental nacional. Em nosso estudo, utilizamos os métodos de pesquisa analítica, especializada e econômica do sistema.

Palavras-chave: biocombustível, economia verde, bioetanol, energia verde, gestão ambiental.

Introduction

A number of specialists from the most important analytical centers state that renewable energy sources (RES) will most likely become the leading and the cheapest form of energy production in most countries of the world as early as 2020 (Stanley, 2020). By 2018, the carbon emission from enterprises should be reduced due to economic, not dumping, benefits from RES implementation.

As a result, the countries with favorable climatic conditions will increase costs associated with the usage of wind power to $\frac{1}{2}$ to $\frac{1}{3}$ of the costs of power plants using natural gas or coal, and for countries where the governments demonstrate a negative attitude to renewable energy sources, for example, in Australia, about 28% of electricity will be provided by RES. Norwegian authorities plan to completely ban the heating of houses with oil products and gas, which should be replaced by specialized boilers that work on wood sawdust, renewable energy sources and heat pumps by 2020. In autumn 2016, the Bundesrat (Federal Council of Germany) approached the European Union with the proposal to prevent the use of new cars with gasoline and diesel engines since 2030 (BundesländerwollenBenzin- und Dieselautosverbieten), and in the fall of 2017, the senior officials of relevant ministries of China formulated the program according to which by 2020 the vast majority of vehicles will be converted for RES fuel consumption, including

biofuel and electric power (Fuel of the future: China will switch to bioethanol by 2020)

At the same time, US economy, the largest in the world in terms of biofuel consumption, stops to provide favorable and protectionist conditions to RES-based energy plants. As President D. Trump has said: «Today we celebrate the start of a new era in American energy and production and job creation. The action I'm taking today will eliminate federal overreach, restore economic freedom, and allow our companies and our workers to thrive, compete, and succeed...» (Trump signed a decree to abolish measures imposed by Obama to protect the environment).

This decision was not made spontaneously, it had been developed over several years. The U.S. President D. Trump in his book «Time to Get Tough: Make America Great Again!» wrote: «Obama promised he was going to create millions of so-called «green-collar» jobs. He used this promise to justify his massive government give-away of billions and billions of taxpayers' dollars to green energy companies. We're now seeing the results of Obama's promise and big government scheme. Solyndra, a U.S. solar panel company, turned out to be a total bust. They were selling \$6 dollar panels for \$3. It doesn't take a genius to realize that's a loser of a business model. But Solyndra's owner, billionaire George Kaiser, had an inside connection with Obama: Kaiser was a big Obama donor and one of the

president's campaign fundraiser «bundlers». So the Obama administration fast-tracked a \$535 million federally guaranteed loan. Obama believed so much in Kaiser and Solyndra that he made a big public relations event at Solyndra to deliver a speech singing the praises of Solyndra, green jobs, and justifying why taxpayers should foot the bill to stimulate green companies. Predictably, the company went bankrupt, its 1,100 workers lost their jobs, and the American taxpayer got the shaft to the tune of over half a billion dollars» (Tatuev et al, 2017).

However, it is clear that, although the final decision to support the RES implementation is still under review, this industry has already become so mighty, that the Russian government should consider the development of national economy in the next 3-5 years taking into account the significant transformation of the world energy market.

Results

It has to be noted that the main part of world's biofuels production are firewood and dried manure (60%), which are used by up to 40% of the world population for heating houses and cooking (Tatuev et al, 2017).

As for transportation biofuels, bioethanol and biodiesel share the major part of world market, with 74% and 26% respectively (Galazova et al, 2016). Bioethanol prevails in the US, Brazil and in the near term in China, and biodiesel is mostly used in the EU (Nagoev et al, 2015). Bioethanol is obtained mainly from sugar cane (about 60%) and grain crops (about 40%) (Kelner & Polozov, 2016). The main types of raw materials for biodiesel production are soybean and rapeseed. All attempts to market liquid biofuels produced of non-food crops sources have been unsuccessful.

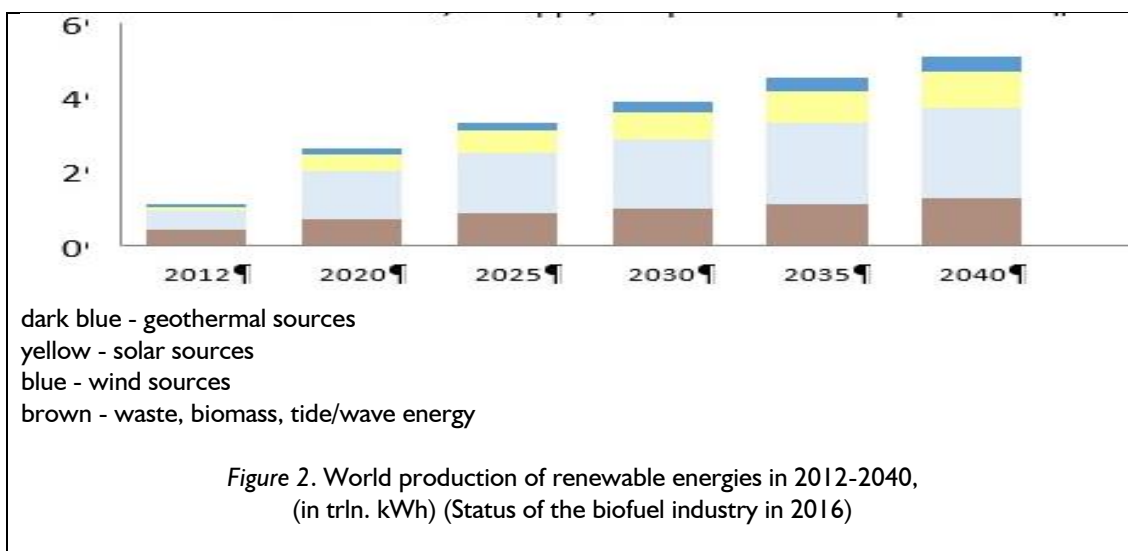
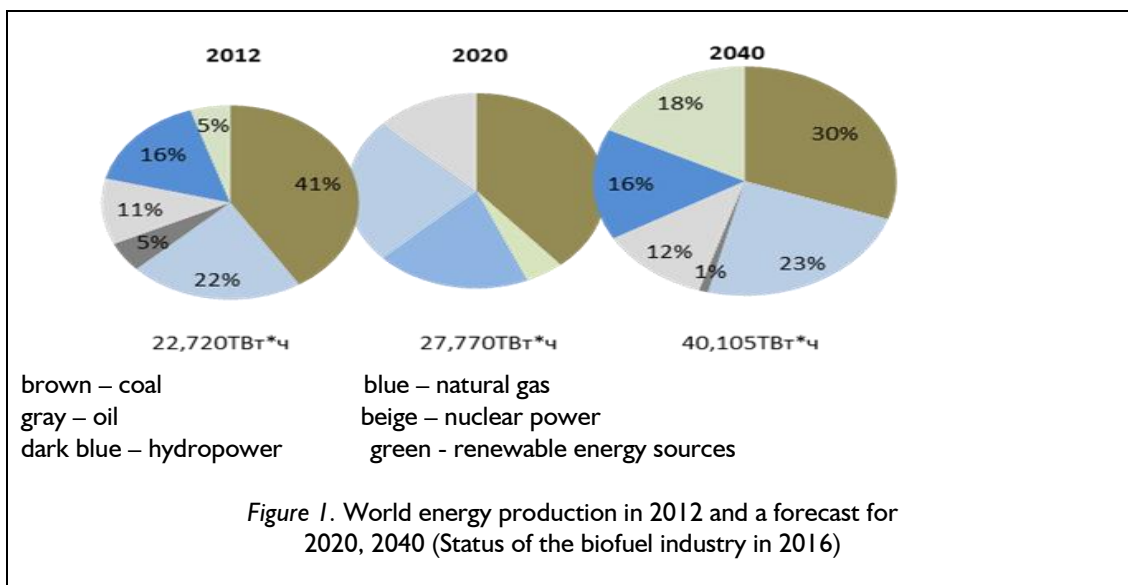
By the beginning of 2014, about 200 US plants produce transport biofuels, there are 50 of them in EU, and in Russia we find no more than 10 biofuel producers including. in Vladikavkaz, Kirov, Omsk, Belgorod and Rostov regions. In

other regions, they are either in the project launch stage or at the trial/minor batch stage. Optimistic estimates suggest that by 2020 the Russian biofuel production will obtain 5 million tons per year, but the addition of alcohol-containing additives to the fuel requires additional excise taxation (which regularly raises in recent years in the context of public health initiatives), which reduces already small efficiency of this kind of production, even despite the introduction of a special government regulation in the industry (Tatuev & Ashkhotov, 2010).

According to experts, the potential for biogas based production of electricity and heat energy is 150,000 GW and 170,000 GW, respectively, and with a total power generation of just over 1,000,000 GW in Russia in 2016, the bio-products can cover the total needs for electricity by up to 15% (Fücks, 2016).

The Russian Energy Market Council (which acts as a non-commercial partnership) now includes 4 chambers, incl. energy sellers (74 companies), buyers (232 large consumers and electricity retailers), experts (100) and infrastructure organizations (4 members). At the end of March 2017, the participation of representatives of green energy producers (JV Renova and Rosnano) in this Council was denied, largely because of the fact that in 2016, the share of green power in the Russian market was 0.007%, and according to the most bold estimates, by 2024 it will reach 5.5 GW, 3.3 GW of which will be generated by wind, 1.76 GW by sun, and 425.4 MW by small hydropower plants (their capacity is not more than 25 MW) (Green generation is banned), i.e. 0,5% of the total amount of electricity produced in the Russian Federation.

The world economy reveals a more positive picture for the markets of alternative energy sources, incl. green energy, but even by 2040, according to the official forecasts, the 100% replacement of traditional energy sources by renewable ones is out of question, particularly with regard to biofuel. (Fig. 1, 2).



However, one should not forget about frequent inconsistencies between forecasts and reality, even in medium-term, not to mention long-term prospects for the development of high-tech industries. For example, R. Fücks states in his work «The Green Revolution», that in summer 1993 German newspapers wrote: «In the future, the sun, water and wind will cover our needs for electricity by no more than 4%» (Tatuev et al, 2017), but in less than 10 years, ¼ of energy generated in Germany was produced from renewable sources. The situation is similar in other leading European economies, especially in the Nordic region, and by 2011 the indicators of renewable energy production in the EU countries seem to be quite impressive (Gasoline from beet-root or electric motor)

According to R. Fücks, such a rapid development of German green energy sector became possible

due to the Law on Renewable Energy Sources, which entered into force in early 2000. It guaranteed the green electricity distribution for 20 years and imposed to electricity retailers the obligation to give preference to green energy suppliers. Additional costs were included in the price of electricity. This made it possible to increase the financial burden on TPPs and nuclear power plants, rather than on equipment that generates electricity. The law ensured a long-term stability of investors' incomes, which led to a real investment boom. Germany became the world leader in wind and solar energy production, and in such regions as Mecklenburg-Western Pomerania, Schleswig-Holstein and Brandenburg, the share of renewable energy today is already 75% of the total energy consumed, while, as R. Fücks states, in the near future the needs for electricity will be fully covered by environmentally friendly sources.

With regard to biofuel issues, especially when it comes to solid biofuels, things are not that simple, according to a number of experts. «Biofuel can do much more damage to the environment than conventional gasoline», conclude the researchers from the Massachusetts Institute of Technology. «Replacing gasoline with biofuels will double the emission of greenhouse gases into the atmosphere. One of the main reasons is the massive logging of forests all over the world. In order to stop depending on gasoline by 2050, it is necessary to replace 59% of forests with fields for bioethanol production. This will lead to an increase in carbon dioxide emissions by 9 million tons per year. According to scientists, harmful emissions from biofuel can 2 or 3 times exceed those caused by the common gasoline» (Donald J. Trump Time to get tough).

And as for liquid biofuel, there are also some reasons to feel insecure: for example, if we assume that the time will come when a failure of the main agricultural crops happens (something similar to the grain crops failure in the USSR and USA in the early 1970s), the plants for the production of bioethanol and biofuels may not be able to work at full capacity, which means they will immediately become uncompetitive. Separate from the long-term forecasts and the extremely unlikely apocalyptic events, some practical steps can be taken giving incentives to the industrial development, for example, in sugar production, grain and forest enterprises:

The sugar industry in Russia is about the following: production of granulated sugar by processing domestic sugar beets from October to March, and (or) processing foreign (primarily Brazilian) sugar cane from April to August (Tatuev, 2015). Over the past 20 years, there have been periods when sugar cane was the raw material for up to 72% of total sugar production, but currently it has declined to 4-10% (Tatuev & Sklyarenko, 2016). The sugar production from sugar beets is more costly, but this process gives additional jobs to agricultural workers and allows for improved food security of the country (Boltayevskiy et al, 2016). But nowadays, in the conditions of almost complete elimination of cane processing, Russia's sugar plants have annual downtime of 6 to 10 months, instead of 1-4 months with their optimal loading and foreign raw materials -, as it was in previous decades (Tatuev, 2014).

If, instead of sugar cane processing, Russian sugar plants shift to the production of bioethanol with a guaranteed outlet of their product through state-owned fuel and energy corporations, the loading of these plants will obtain the maximum capacity, which, in turn, will make them more competitive on both domestic and global food and biofuel markets (Sklyarenko et al, 2016).

The latest success in cereals harvest has unfortunately turned into disaster in Russia, since the manufacturing of end-product from grain crops is disappearing, and the overcrowding of grain storage facilities (elevators) along with the weak potentials for entering the world grain market drive the Russian economy to the development of bioethanol production (Brovkin & Ablaev, 2015; Ablaev, 2007).

It is also difficult to overestimate the role of the forestry complex in the production of solid fuels in Russia today. According to the data presented in the work of I.G. Sudakova, N.B. Rudenko «Production of solid biofuels from vegetable wastes (review)»: Production of fuel wood pellets in the Russian Federation is growing steadily, in 2012 its volume reached 1 million tons (excluding agro pellets). Most of the wood pellets produced in the Russian Federation are exported to Europe, in 2012 the pellets export rose to approximately 850,000 tons per year. At the same time, pellets are supplied mainly to the industrial sector, as the European pellet market for private consumption is dominated by local producers. In 2012, Russia was the fifth largest exporter of pellets after the USA, Canada, Latvia and Germany. The main consumers of Russian pellets are, for several years, Denmark, Sweden, Finland, Latvia, Germany.

Generally, pellets and briquettes are exported from the North-West Federal District, but also from the Central part of Russia and Siberia (the Krasnoyarsk Territory). For example, in 2011, 19.8% of the total production of fuel pellets were exported from the Krasnoyarsk Territory, where two large wood processing centers - the woodworking plant «Yenisey» and the timber and chemical plant «Novoyeniseisky». Domestic consumption of wood briquettes grows on average by 2-4% per year and is no more than 10-15%. In 2012, the pellet consumption was at the level of 150,000 tons per year in Russia (Sudakova & Rudenko, 2015).

Some positive trends towards the development of solid biofuel production are apparent in other

regions of Russia (Kirillov, 2016). The diversification of fuel industry is a critical issue, in particular, for the Khanty-Mansiysk Autonomous Region, where the extractive sector shares 88.8% of total industrial production, and more than the half of Russian oil (53.5%) is extracted there, but the share of processing industries does not exceed 4.5% of the region industrial production (Yagodkina, 2016). According to the

data cited by N.I. Ovcharova and E.V. Zavedeeva in their article «Development of the timber processing complex as one of the directions for economic diversification of the Khanty-Mansiysk Autonomous Region – Yugra», in the last 5 years, production of pellets (fuel pellets) has been established as part of diversification program (see Table I).

Table I – Key indicators of the timber industry development in Khanty-Mansiysk Autonomous District - Yugra (Ovcharova & Zavedeev, 2016).

Main indicators of the Khanty-Mansiysk timber processing industry	2005	2008	2009	2010	2011	2012	2013	2014
Timber harvest, thousand m ³	1794	1760	1309	1800	2300	2400	2800	2300
Woodworking industry:								
Sawntimber, thousand m ³	407	425	401	305	268,8	277	305	279
Including exported sawnwood, thousand m ³	219	192	200	166	158,8	160	165	153
Fuel pellets, thousand tons			3,7	7,7	11,75	13	14,75	23,1

The state program «Development of Forestry and the Timber Industry Complex of the Khanty-Mansiysk Autonomous Okrug (Yugra) for 2014-2020» assumes the increased production of fuel pellets and the modernization of main production assets. The 4th stage of the pellet workshop at the Barsovo production plant is planned to increase the total pellet production to 32,000 tons per year (the volume of investments is 22,000 thousand rubles) (Ovcharova & Zavedeev, 2016).

Discussion

In summary, we can conclude that the development of the biofuel sector of the economy will not in any way hurt the development of the oil, gas and coal industries at least in the short and medium term, but will boost the development of high-tech products for the market, new cross-cutting technologies and will increase the efficiency and profitability of enterprises. It will also allow for the diversification of regional and national economies, growth in export earnings and creation of new high-tech jobs.

Our study permits to suggest the following proposals: within the framework of biotechnological industries support program adopted by Russia's leadership in February 2018 in Novosibirsk, the promotion of biofuel products must be supported at national and regional levels, and the first step would be the abolition of excises for ethanol, which serves as

raw material for bioethanol production. Only if this basic condition is met, the following steps can be taken: the authorisation for GMOs cultivation on an industrial scale for biofuels production, the introduction of preferential tariffs for «green» vehicles, etc. However, in order to restart the development of liquid fuel production, the manufacturing sector should be given guarantees that liquid biofuels would not be taxed.

The development of solid biofuel production in the regions with large forests requires federal financial and institutional support in order to significantly increase the pellet production, as well as support in creating demand for this product in the domestic market and in promoting this product to the foreign markets, first, in East Asia (China) and secondly, in Europe.

To conclude, we should like to refer to a leading Russian expert in this field, Ablav A.R. who wrote that «Biofuel production is an important sector in many of the world's leading economies, and it will remain a tool to increase domestic demand for agricultural and forestry products. Currently, there is a close relationship between food and oil markets, and this relationship will only increase, leading to fluctuations in food and energy prices. Russia will play an important role in supplying biomass to the world market. Whether this biomass will be in the form of wood and grain, or in the form of processed products with high added value, is solely in our hands» (Ablav, 2017).

Results

We found the main reasons for the transformation of the national economy towards its greening, the main principles and methods which should be used to encourage enterprises to participate in biofuel support programs. The excessive value of new energy products at the present stage is defined as the main factor posing obstacle to the use of biofuels. To radically increase the efficiency of introducing innovative biofuel products in Russia, we offer a comprehensive simplification of national biosafety control system and an increased subsidizing of its development. In conclusion, some proposals to facilitate the implementation of biofuels have been presented as an important tool of stabilization and economic growth of the country.

A stronger government support for the promotion of biofuels introduction programs is today one of the most urgent challenges for economic growth and security of the Russian Federation.

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