

Problems of development of bio-energetics in the Russian Federation

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Abstract. The current power balance in the world is formed mainly on the basis of three non-renewable hydrocarbonic energy sources - natural gas, oil and coal. Limitation of mineral stocks of fuel and the necessity of the maintenance of ecological safety has caused intensive growth in use of renewable energy and, in particular, bio-energy.

The available resource potential of biomass in Russia is practically inexhaustible: it includes significant reserves of bio-energy - in agriculture, arable land - 9% of world; in forestry - up to 25% of world's timber reserves.

Biofuel production is possible from the following raw materials: diesel biofuel, produced from oil of sunflower and oilseed rape; bioethanol, from sugar beet, corn, wood; biogas, from waste materials of animal production, food and wood processing.

The project of offering proposals for state regulation of the development of bio-energetics has been prepared, including two blocks: normative legislative documents regulating the development and maintenance of bioenergy; support of innovative financial activity - investment and taxation.

Realization of the planned complex measures on acceleration of rates of bioenergetics development in the Russian Federation will allow solving the following problems: to increase by 1.3–1.5 times the provision of animal production in fodder protein; lowering dependence of the agricultural sector on a stable rise in prices for traditional power resources; to provide a steady power supply for the agricultural population and agricultural production in the zones with decentralized electric supply.

Key words: bio-energetics, biofuel, bioethanol, biogas, legal documents

INTRODUCTION

Russian agriculture is one of the world's largest consumers of power resources. According to the Ministry of Energy Production of Russia, agriculture annually consumes 18.5% of diesel fuel (5.0 million tons), 6.0% of gasoline (1.5 million tons) acted upon the home market, 6.2% of the electric power (58.5 billion kilowatt-hour).

Currently, the world power balance is formed mainly on the basis of three non-renewable hydrocarbonic energy sources - natural gas, oil and coal. Last year's world production of oil and gas had insignificant rates of growth – 1.5-2% - and does not match rapidly growing requirements of the economy for power resources.

Necessary decisions regarding global problems connected with limitation of mineral stocks of fuel and maintenance of ecological safety have caused intensive growth of the use of renewed power and, in particular, bio-energetic power. The

greatest demand is for motor biofuel: the number of cars approaches 1 billion units; their engines burn about 80% of all fuel.

Energy from biomass in the world power balance represents 13%, and rates of growth are impressive - 10% per year on average within a given sector. The biomass accumulating in solar energy in the form of hydrocarbons from phytogenesis serves as the initial raw material for production of biofuel in solid, liquid and gaseous form depending on processing technology.

Although Russia possesses the largest stocks of non-renewable energy sources and in 2006 ranked first, globally, in oil recovery, the supply will last only 30–40 years. At the same time an available resource potential of biomass in Russia is practically inexhaustible: it is formed with significant reserves of raw materials for bio-energetics, with 9% of the world's arable land for agriculture and up to 25% of the world's timber reserves from forestry stocks.

ANALYSIS OF PROBLEMS

Among the kinds of biofuel which are being expanded throughout the world, the Russian Federation has a significant potential for the development of the following kinds of diesel biofuel:

1. Mixed biofuel, usually consisting of oilseed rape oil mixed with diesel fuel. The best ratio for a balance of energy is 75% oilseed rape oil and 25 % diesel fuel.
2. Diesel biofuel in the pure state - a methyl ether or vegetable oil.
3. Biofuel in the form of a mix of diesel fuel and methyl ether or vegetable oil.

The Russian Federation already produces approximately 1–2% of the world's biofuel. Leaders in the manufacture of diesel biofuel are Germany, France, Italy and USA. Under the forecast made of the account of declared capacities, consumption by bio-diesel engines will increase by 15 million tonnes by 2010, in comparison with 2005.

Bioethanol is widely used as alternative fuel for petrol engines in the world. Brazil and USA annually produce nearly 13 million tons of this fuel. In global agriculture sugar cane, corn and various grain crops are primarily used for the manufacture of bioethanol. In the Russian Federation, the potato and various grain crops were traditionally used for the manufacture of ethanol.

In the agrarian and industrial complex of the Russian Federation ethyl spirit for food and technical purposes is produced by 173 enterprises. Their total capacity is 1.6 million tonnes, and average loading - about 41% (producing 687 thousand tons of spirits).

Use of grain crops. The manufacture of bioethanol as an additive to motor fuel on an industrial basis, using technology with a truncated rectification cycle, is absent in Russia. Our calculations show that the most effective materials for this are sugar and grain sorghum, corn, sugar beet, artichoke and wheat.

Potentially, expansion of crops of sugar and grain sorghum, corn and wheat to achieve an area of 5–6 million hectares that will allow the production of 6–7 million tons of bioethanol is only possible only in the Southeast zone of the European part of Russia.

The Russian need for bioethanol suitable for use in the gasoline consumed in the home market, up to 5% as it is supposed by specifications, will amount to 1.25 million tons.

Biogas development. Biogas is the other kind of motor biofuel which is being intensively developed in the European Union countries. Biogas technology uses the process of fermentation – the decomposition of organic materials by microorganisms. The basic products of this process are combustible gases (mainly methane, hydrogen, carbon monoxide) and organic fertilizer. The given technology allows solving effectively the serious environmental problems arising from recycling of waste on cattle-breeding farms.

In agriculture in Russia more than 50 million tonnes of waste organic substance from which 75 billion cubic meter of biogas can be manufactured is annually produced in animal industries.

Legislative and political involvement. Active use of alternative renewed energy sources, including that from agricultural raw material, in USA, Japan, Brazil, Canada and the Europe Union countries was accompanied by acceptance of the corresponding legislation and various programs of support. Introduction of a new kind of fuel in the Russian Federation would be impossible without serious political and economic support.

The Euro Parliament on 18 June 1998 declared the necessity of increasing the share of biological fuel in the market within the next 5 years by activating measures such as the following:

- Tax exemption;
- Financial support of the enterprises producing biofuel;
- Introduction of an obligatory quota on the manufacture of biological fuel for the oil refining companies.

Use of vegetable oils. Currently in Russia there is no enterprise manufacturing diesel biofuel, but there are capacities and significant experience in producing the vegetable oils used for its manufacture.

Seeds of various olive cultures can be applied to the manufacture of diesel biofuel. Russia possesses high competitive advantages in their manufacture, leading in the production of sunflower oil: manufacturing has increased by 2.5 times in the last 5 years, producing 6.7 million tonnes in 2006. However, further expansion of crops can negatively affect fertility and the phytosanitary status of soil.

The most favorable culture in nature-climatic conditions of Russia is oilseed rape, which also has wide circulation in Europe. In 2005–2006, the Ministry of Agriculture of Russia has increased production of oilseed rape 2 times - up to 530 thousand tonnes. Areas of oilseed rape crop in the Republic of Tatarstan, and the Lipetsk, Oryol, Tula, Kemerovo and Omsk areas increased considerably in 2006.

In 2007 in the Russian Federation the area of oilseed rape increased to 1,2 million hectares; in the Republic of Tatarstan up to 200 thousand hectares is predicted, in

Stavropol Territory up to 75 thousand hectares, in Lipetsk area up to 60 thousand hectares, in the Krasnodar and Altay territories up to 50 thousand hectares.

Overall, additional opportunities to realize the potential of 9% of arable land in Russia exist.

Political and economic support. As world experience as shown (USA, Canada, China, Brazil, EU countries), introduction of new kinds of fuel into the power balance became possible only owing to serious political and economic support by the state, development of the corresponding legislation, and preferential taxation and budgetary support. Accordingly, the Order of the European Parliament and Advice of the European Union from May, 8th 2003 year 30 « About measures on stimulation of use of biological fuel and other kinds of renewed fuel in transport sector », with a view of performance of requirements of the Report of Kyoto, establishes the minimal shares of use of biological and other kinds of fuel. From the general volume of gasoline and diesel, presented in the markets, the share of biofuel should make up to 2% by December, 31st 2005, up to 5.75% by December, 31st 2010, and up to 20% by 2020.

Many countries are creating special enforcement authorities to actualize the programs and coordinate jobs in the field of alternative energy production.

Russian strategies for bio-energy development. In Russia the organic law adjusting the attitudes in the sphere of the use of power resources and saving of energy is the Federal Law accepted in April 1996, 28-FZ: "About saving of energy", however it has no bio-power orientation. The concept of renewable energy sources and alternative fuel is given, but biofuels such as biogas and products of biomass processing are only mentioned.

The second document mentioning the attitudes in the sphere of bio-energetics is

« Power strategy of Russia for the period till 2020 », approved by Order of the Government of the Russian Federation on August, 28th, 2003 №1234 in which there are no concrete measures for development of bio-energetics.

In this connection, The Minister of Agriculture of Russia has, on December 4, 2006, addressed the President of the Russian Federation with the proposal to charge the Government of the Russian Federation to prepare a complex of measures on the accelerated development of bioenergy. Provisions include the following:

- Development of the normative-legal documents regulating obligatory use of biological additives in motor fuel;
- An establishment of special tax conditions for manufacture and realization of motor fuel with the maintenance of biological additives;
- Financing, due to means of an investment fund, projects for the cultivation of high-energy cultures and construction of factories for manufacture of biofuel.

The president gave the corresponding assignment to the Government of the Russian Federation until June, 25th to prepare proposals on the accelerated development of manufacture and consumption of biological kinds of fuel, including:

- Normative-legal maintenance of development of bio-energetics;
- Support of innovative and investment activity in the field of bio-energetics.

The Ministry of Agriculture of Russia is developing the project proposed through state regulation of development of bio-energetics, including those two provisions.

1. Legislative and normative-legal maintenance

1.1. Development of the project of the Federal law « About bases of development of bio-energetics in the Russian Federation »;

1.2. Development of the project of the Federal law « About modification and additions in the Federal law from November, 22nd, 1995 171-Ф3 «About state regulation of manufacture and a turn of ethyl spirit, alcoholic and other spirit production »;

1.3. Preparation of proposals in the project of the developed Federal law « About saving of energy» regarding bio-energetics;

1.4. Development of the project of the Federal law « About modification in the Tax code of the Russian Federation » regarding the taxation of motor fuel containing biological additives;

1.5. Preparation of the project of the Federal law « About modification and additions in the Federal law from 1995 193-Ф3 « About agricultural cooperation » regarding distribution of positions of the law on manufacture of biological kinds of fuel;

1.6. Preparation of proposals on entering into the project developed « Power strategy of Russia for the period till 2030 of " section « Development of bio-energetic »;

1.7. Preparation of proposals on inclusion in the program of development of the technical rules, approved by the Governmental order of the Russian Federation from 5/29/2006 781-Й, development of the special technical rules « About safety of products of bio-energetics »;

1.8. Preparation of offers on inclusion in New edition of OKP (the all-Russian qualifier of production) products of bio-energetics;

1.9. System engineering of national standards Russia (GOST) on bio-energetics (kinds of bio-additives, biofuel, methods of their tests and uses);

1.10. Preparation of the project of the Governmental order of the Russian Federation « About modification in « Regulations about the Ministry of Agriculture of the Russian Federation », approved by the Governmental order of the Russian Federation from 3/24/2006 №64 regarding an establishment of powers of the Ministry of Agriculture of the Russian Federation in the field of bio-energetics;

1.11. Preparation of the project of the Federal target program « Development of bio-energetics in the Russian Federation for the years 2008-2015 »

2. Support of innovative and investment activity

2.1. Coordination of jobs on preparation of the investment project on development of bioenergetics in the Russian Federation (manufacture of olive cultures, reception of biological additives, biofuel, albuminous forages with the purpose of addressing the complex decisions of available problems);

2.2. Participation in development and realization of investment projects on bio-energetics on conditions of the private-state partnership (cultivation of high-energy cultures, construction of factories for manufacture of biofuel and albuminous forages);

2.3. Preparation and realization of the departmental target program «Development of manufacture and processing panca in the Russian Federation for 2008–2010 »;

2.4. Development and realization of the departmental target program on expansion of crops of high-energy cultures for 2008–2010;

2.5. Preparation of offers in the Government of the Russian Federation on stimulation of expansion of crops of high-energy cultures by subsidizing on 1 hectares of crops;

2.6. Preparation of proposals in the Government of the Russian Federation under the customs duties directed on development of the market of high-energy cultures, biofuel, the process equipment and manufacture of fodder fiber;

2.7. Development of the mechanism of " sale of carbon credits » within the limits of realization of positions of the Kyoto Report;

2.8. Preparation of offers for entering additions into the Plan of measures on development of domestic agricultural mechanical engineering for 2006–2008 approved by order of the Ministry of Energy of Russia from April, 27th, 2006 96, on development and manufacture of means for cultivation, post-harvesting to processing and storage of seeds of high-energy cultures, their processing and use;

2.9. Preparation of offers for entering into the list of critical technologies of the Russian Federation approved {confirmed} by the President of the Russian Federation on May, 21st, 2006 842 - «Technologies of bio-energetics »;

2.10. Development of proposals on inclusion in curricula of specialization in the field of bio-energetics on the basis of perfection of the state educational standards and documentation teaching-program.

Large pilot investment projects on the manufacture of biodie sorghum sel fuel (on the basis of oilseed rape oils) and bioethanol in a number of subjects of the Russian Federation, including the Republic of Tatarstan, Krasnodar territory, Lipetsk, Voronezh, Belgorod, Rostov, Omsk areas and other regions are developed and are being realized.

The development of bio-energetics in the interests of the country demands closer integration and coordination of jobs with the ministries, departments and the corporations which are carrying out manufacture of biological hydro-carbonic raw material, processing of wood and extraction and processing of mineral raw material.

3. Development {manufacture} of recommendations for bodies of the government

4. Other forms of participation according to the legislation of the Russian Federation.

CONCLUSIONS

Realization of the planned complex measures on acceleration of rates of development of bio-energetics in the Russian Federation will allow solving the following state problems facing the bioenergy sector of the economy:

- To increase in 1.3–1.5 times security of animal industries in fodder fiber;
- To increase profitability of agricultural production and investment appeal of bio-energetic agriculture;

- To lower dependence of the sector on a stable rise in prices of traditional power resources;
- To provide a steady power supply to the agricultural population and agricultural production in zones of decentralized electric supply;
- To create new workplaces in various branches of the economy;
- To expand and change the structure of exports.

REFERENCES

- С.Г.Митин, Л.С.Орси́к, Ю.Л.Колчинский и др. 2007. Биоэнергетика: мировой опыт и прогноз развития: Научно-аналит. обзор. — М.: ФГНУ «Росинформагротех», 204 с.
- В.Ф.Федоренко, Ю.Л.Колчинский, Е.П.Шилова. 2007. Состояние и развитие производства биотоплива М.: ФГНУ «Росинформагротех». 130 с.
- Альтернативы дизельному топливу для сельского хозяйства //DLZ. 2005. № 1, 80–81.
- ATZ: Automobiltechnik. 2004. № 5, 21–23.