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THE MECHANISM OF STIMULATION OF DEVELOPMENT OF BIOTECHNOLOGIES IN FOREIGN COUNTRIES

The biotechnology is one of scientifically-practical priorities of the XXI century. The key role in stimulation of development of biotechnology in foreign countries is taken up by the state which solves this problem by means of a complex of measures both administrative, and economic influence.

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Nowadays the world's economy suffers a constant increase of a hi-tech influence and in connection with this, the problem of investigation of various mechanisms of scientifically-technological development which correspond to modern ideas of scientific and technical progress arise. Thus, the mechanism of scientifically-technological development is understood as the system of mutual relations between the state, scientific and technical sphere and market which provides constant development and updating of technological armament of manufacture [1].

The EU countries are among the leaders in manufacture of the energy which is based on nonconventional renewed energy source (NRES). The most impressing successes are reached in development of a wind power, the sun and biomass. In the present time about 70 % of energy developed in the world by the wind energetic units is given by the EU-27 countries. The share of the countries in the world's energy production by the wind energetic units is presented in table 1.

In the total capacity of the established solar collectors, the European Union strongly keeps the second place conceding to China. The use of biomass in a power economy of EU extends. In 2005–2008 in Austria, Great Britain, Finland, Sweden the large thermal power stations working on a biomass, including the agricultural, household and various industrial wastes containing organic chemistry started to work. The interest of investors to the development of the sea wave's energy and inflow grows. In 2002–2008 in Great Britain, Ireland, Spain the wave power stations were constructed and started to operate.

There are various conditions for development of nonconventional power in the countries of the European Union. These distinctions are caused by the following factors:

1. Geographical and natural (a rain, a direction of water streams, solar intensity, presence of fossil power resources, etc.).
2. Economic (an oil and gas price, a size of the subvention for traditional sources based' power manufacture, a system of economic regulation of nature protection, etc.).
3. Political and social (the international obligations and programs, influence of "Green" parties in the state bodies and local authorities, the administrative initiative and responsibility, public opinion, etc.).
4. Technological.

The combinations of these factors influence the way and prospects of development of nonconventional power in the abovementioned countries. For example, Great Britain, the Netherlands and Romania, which possess oil and gas in the territory, are less anxious to develop the nonconventional power, than the majority of the EU countries. The countries of Southern Europe have more favorable possibilities for a solar energy use, than countries of Northern Europe. It is not a surprise that Greece surpasses Sweden in total capacity of the established solar collectors. And Sweden has higher a hydro energy potential. This is reflected in the structure of the electric power manufacture based on renewed sources. If almost 80 % of "pure" energy in Greece are made on the basis of solar energy, in Sweden about 90 % of cumulative manufacture of the electric power based on renewed sources devoted to hydroelectric power station.

Favorable geographical and environmental conditions are important, but not the only condition of the successful development of renewed power. So, the best conditions for wind energy units in Europe the Great Britain, Ireland, France and Estonia possess. As a result of favorable geographical and an environmental conditions the wind energy units in Ireland can produce twice more electric power, than the same

Table 1

The share of the countries in the world's energy production by the wind energetic units, %

Countries	Share
Germany	32
USA	19
Spain	17
Denmark	7
India	6
Italy	3
Great Britain	2
Netherlands	2
Portugal	2
Australia	1
Sweden	1
Other countries	8

units established in Germany. However, thanks to the state support effective methods the general capacity of the wind energy units in Germany (more than 19,000 MW) 10 times surpasses the capacities of all wind energy units of Great Britain, Ireland, France and Estonia all together.

In conditions of globalization of economic and an aggravation of the problems connected with the climate change, the role of the international obligations as motivator of development of alternative energy sources has increased. In 1997 as the initiators of the Kiotsky report, the EU countries have declared their readiness to decrease 8 % of emissions of "hotbed" gases by 2008–2012, including Germany and Denmark – 21 % less, Australia – 13 % less, Great Britain – 12.5 % less. The performances of these international obligations of the EU countries connect with the development of NRES and the increase of their share in the power balance. According to the instructions of the EU and a national programs on stimulation of a renewed energy sources by 2010 it is declared to increase a share of "pure" energy in the general current consumption of the EU countries 8.1 % more, including Denmark – 20.3 %; Greece – 11.5 %; Sweden – 10.9 %; Great Britain – 8.3 %; Austria – 8,1 %; Germany – 8 % [2].

The important role in development of nonconventional power a technology factor is played. The development of nonconventional energy sources is based on the uses of progressive technologies and the equipment, providing long terms operation, modern control systems, diagnostics and the safety control. Having a high innovative potential and the advanced power machine-building base Germany (firms Tacke, RePower, Enercon), Denmark (Bonus Energy, Vestas Wind Sistems), Spain (Gamesa) not only provide wind energy units for their own countries, but also provide such complexes to Britain, Italy, France and other countries.

To this far incomplete list of the factors, defining the modern level and prospects of development of NRES, it is necessary to add the adverse political climate, the thought up strategy of development and the effective mechanism of stimulation of development of nonconventional power.

The key role in stimulation of development of nonconventional power in the EU countries is taken up by the state which solves this problem by means of a series of administrative measures, and economic influence.

The basic methods of economic influence are:

– coordination of the design documentation and delivery of licenses for building of operation objects;

– carrying out the tenders for realization of projects in the sphere of nonconventional power;

– obligatory quotation of manufacture (consumption) of the electric power based on the renewed sources and penal sanctions for defaults of the established obligations;

– information and ethical support of the renewed power;

– assistance to the administrative structures of different levels to carrying out the advertising companies, exhibitions and presentations of power saving technologies.

The mechanism of economic influence includes the following tools:

– extra charges to tariffs for the NRES energy;

– free manufacturers of "pure" energy from the power taxes;

– quotas and "green" certificates;

– crants from special fund;

– cuarantors on research and development in the field of nonconventional power;

– the accelerated amortization of the equipment;

– participation in financing the objects of nonconventional power use (with participation of the state, private business, local authorities, the population);

– state research and development financings in sphere of nonconventional power (grants).

In the majority of the countries the preference is given to one of the listed above tools, though some countries (for example, Australia, Belgium) uses wider scale of stimulus. In table 2 the countries using concrete tools of economic influence are presented.

Let's have a more detailed view on the stimulation tools of development of nonconventional power in the EU countries.

1. Austria.

The system of NRES encouragement in Austria is the most difficult. Except the basic specified tools this system includes various kinds of direct subsidizing, soft loans, tax discounts. Thus in each of its nine regions Austria operates nine various decisions, regulating tariffs for NRES. There are considerable regional distinctions in tariffs for the NRES (a solar energy – 32 to 1, a biomass energy – 8 to 1). Authoritative European experts estimate the Austrian system of NRES stimulation as chaotic, considering as more rational the simple systems with smaller quantity of regulators. Thus, as a rule, refer to experience of Spain and Denmark [2].

2. Spain.

One of the most considerable achievements of Spain in wind power use we can name the conditions, withdrawn to builders: along with the investments into the wind energy objects they have to carry out obligatory additional investments into the development of infrastructure or the social sphere of the corresponding region. Thus, arising additional financial expenses as the Spanish practice shows

Table 2

The tools of economic influence on the development of nonconventional power in the EU countries

Stimulation tools	Countries which use such tool
Extra charges to tariffs	Australia, Germany, Greece, Denmark, Spain, Luxembourg, Portugal, Finland, France, Sweden
Free from power taxes Quotas and "green" certificates	Netherlands, Slovakia, France, Czech Republic, Sweden
Grants from special fund, based on the reception of taxes, connected with the traditional source electric power	Austria, Bulgaria, Great Britain, Hungary, Netherlands
Grants for the research and development in the field of nonconventional power	Great Britain, Germany, Denmark, Spain, Finland

are not burdensome for investors. At the same time this sphere of investment allows to lower the resistance of local population and the regional ecological organizations to building of the wind energy units.

3. Denmark.

The successes of Denmark in the development of nonconventional power are connected with the use of rational forms of the private-state partnership and attraction of broad masses of the population to realization of projects on development of renewed energy sources. The share form of financing of investment projects of nonconventional power units was extended in this country (with participation of the state, private business, local authorities and the population). Such form of partnership allows not only integrating interests of federal and local authorities, businessmen and the population, but also it is rational to distribute incomes and possible risks between participants of the concrete investment project. The long-term experience of use of the given form of partnership of the state, business and the population is saved up in Denmark in the work of more than 3,000 energy units which joint proprietors are 150 thousand citizens.

Last years the share form of financing of investment projects in the sphere of nonconventional power takes its root into Spain, and the Spanish experience of additional obligations of investors in the development of social sphere and infrastructure is recognized in Germany.

4. The Netherlands.

In the Netherlands the stimulation of a renewed power is based on a tax tools use. Thus the state leans on Keyn's concept of demand stimulation, releasing the consumers of the energy received from all kinds of renewed sources from the taxes (since 2002 this privilege is cancelled for hydro electric power station). Notice down that the tax regulators are the subject to private changes; therefore initiatives of investors in development of NRES restrain absence of long-term guarantees and essential risks. The Dutch model of stimulation of NRES which kernel are taxes, has not received a recognition in the EU countries though many tools of a tax policy are widely used in the European countries, carrying out an auxiliary role in the national systems of stimulation of nonconventional power.

5. Great Britain.

The original system of stimulation of the nonconventional power, based on a quota system and certificates, takes a root into Great Britain in the last decade. Its essence is that the state establishes the minimum quota of consumption (manufacture) of the electric power from renewed sources in the total amount of power consumption (manufacture) to the companies. In 2006–2007, for example, this quota made 6.7 % [3]. The so-called green certificates representing the record in the electronic register, confirming the fact of consumption (manufacture) of certain quantity of energy on the basis of renewed sources of this or that company is thus put into circulation. The companies which have not coped with officially established quotas of consumption (manufacture) of "pure" energy, can enlist their performance by purchase of "green" certificates from the organizations having "a superfluous" share of consumption (manufacture) of "pure" energy. And the companies which have exceeded officially established quotas, can sell these "surpluses" for market prices. Thus, the market of "green" certificates regulated by the state is created. Logic addition of this scheme of formation of the market with "pure" energy are the penal sanctions applied to the companies, not carrying out the established quotas of consumption (manufacture) of the electric power developed on the basis of renewed sources.

The tested model of stimulation of the alternative power approved in Great Britain, combining methods of direct state regulation with market mechanisms, since 2003 takes root in a power economy of Sweden, and last years the recognition is obtained in Austria, Belgium, and Italy.

6. Germany.

Along with wind energy in the EU countries the solar power engineering has started to develop. Germany is the leader in the sun energy use among all European countries, there the half of all solar electric power industry of the European Union is established. The reasons of success of German solar power engineering are caused by a considerable state support of this branch. So, the federal Program of 100,000 solar roofs is realized in Germany and provides the financial grants to investors at a rate of 0.51 billion euro, it is the largest financing program in sphere of solar power in the world. The state gives financial support to building of houses of a new design in which the heating system is based not on use of mineral fuel, but on application of the solar collectors established on roofs of houses and a reformative solar energy in the thermal.

The similar programs of investment stimulation of development of solar energy use in housing sector are accepted in Spain, Luxembourg, Portugal. The state grants allow private investors to cut half expenses on installation of solar panels and approximately twice to reduce production costs of energy on the basis of a sunlight.

In the majority of EU countries the basic stimulation tool for the solar power development as well as wind energy is tariffs and extra charges. The flexible scale of extra charges for generating companies of various capacity, patterns of ownership operates. In Germany, for example, only small installations receive indemnification (capacity no more than 5 MB), in Portugal the more powerful units are supported, however the compensatory surcharges for 1 kW·h of the electric power is twice less, than for small installations. In Luxembourg the private generating companies for 1 kW· hour of the electric power developed by photo-electric elements receive twice bigger indemnification in comparison with the municipal manufacturers. Among the general methods of state regulation of the solar power engineering market in the EU countries the regressive extra charges are used. In Germany, for example, extra charges for the electric power units based on the sunlight annually decrease 5 %, in comparison with the previous year, in Luxembourg – almost 10 % [3].

The European experience shows that there is no only system of stimulation of nonconventional power in EU yet. Each country searches its own rational schemes and effective tools of stimulation. At the same time it is possible to ascertain that two models of motivation of development of NRES: compensatory and quoting operate in the EU. According to the first model the country's state influences manufacture and deliveries of "pure" energy, guaranteeing the generating

companies the long-term fixed prices for the electric power based on NRES. Thus, minimization of negative influence of market condition on dynamics of power consumption and risks for investors is supposed. The second model, unlike the first, assumes a combination of methods of direct administrative regulation (quoting) with market mechanisms ("green" certificates trade for market prices).

In the last years the manufacture and biofuel gets more and more wide use in many countries of the world. So, the considerable part of the collected corn in the USA goes on manufacture of the ethanol used as car fuel. Last year the gain of the corn in the country has reached 10.5 billion, almost 1/5 of which has been processed in 5 billion gallons of ethanol on 112 american factories. If all american ethanol manufacturing factories which are reconstructed or on the stage of building start to operate in the near future by 2008, as the experts of "Business Week" magazine estimated, almost the half of the total amount of gained corn in the USA will serve as a raw material for ethanol reception (2007. № 38(9134). P. 4).

The interest to biofuel manufacture increases not only in the United States, but also the EU countries. So, Secretaries of State for Energy – the members of the European Union have proposed to increase this indicator by 10 % till 2012. However, the majority of the EU countries have not even executed yet the earlier stated agreement to replace the use of fuel into biofuel by 2 % till 2005. Only Sweden and Germany have reached this purpose. As experts point out, one of the reasons of it is the high price on biofuel manufacture, despite the various agricultural grants allocated to farmers in the EU countries. So, as British economists calculated, 1 liter of diesel made from rapeseed costs 0.3 euros higher than the usual oil fuel.

Germany, it is the most active from all EU countries in the problem of biofuel energy use and the replacement of usual fuel into its eco friendly non-polluting analogue. Since 2008, Great Britain plans to undertake the similar measures, and to impose the penalty of 15 penny for the l liter of fuel to the enterprises which will not fulfill the requirement.

The increase of biofuel manufacture will bring the great changes into agricultural sphere, and will influence the development of farming. So it can increase the cost of corn, as it was caused by the increase of ethanol demand made from it, it has already led to a rise of soya-beans and other grain crops prices and a foodstuff. Then such rise can influence the price for meat and soft drinks. The american manufacturers of chicken meat notice that their expenses have already increased by 1.5 bln. dollars a year.

So in the conclusion it is necessary to mention the development of biotechnology should be recognized by a state policy: adequate forms of organizational, financial and information support, both federal and regional, legislative maintenance, stimulation of business and the private-state partnership.

Bibliography

1. Bagrinovsky, K. A. The problems of designing the mechanism of scientific-technological development [Electronic resource] / K. A. Bagrinovsky // Strateg. Ru. Electronic data. 2004. Access mode: www.stra.teg.ru. Title from screen. (in Russian)

2. Klavdienko, V. Stimulation of development of nonconventional power in the EU countries / V. Klavdienko // The problems of the theory and management practice. 2009. № 6. P. 61. (in Russian)

3. Goncharov, V. The experience of formation and management of the innovative environment in the USA / V. Goncharov // The problems of the theory and management practice. 2009. № 6. P. 63. (in Russian)