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## FORMING THE INSTITUTIONAL ENVIRONMENT FOR INNOVATION-BASED DEVELOPMENT OF COAL ENTERPRISES\*

**Problem setting.** The development of the coal industry is one of the main priorities in the economic policy of Ukraine. As stated in the Annual Message of the President of Ukraine to the Supreme Council of Ukraine “On the Internal and External Situation in Ukraine in 2013”, “an effective instrument of economic reforms and mechanism that will provide post-crisis recovery on a qualitative basis is the modernization of the industrial sector as the basis for the economic growth in the long run” [1, p. 41]. Among the priority tasks of modernization of the national innovation system is the “creation of favorable institutional and economic conditions for accelerated development of innovations and modern high-tech production...” [1, p. 173]. Modernization of the coal industry will promote its intensified development, allow achieving a positive effect, provide creation of new jobs and conditions for a sustainable economic growth.

Thus, the effective functioning of the domestic mining industry is impossible without innovation. The increase in the innovation potential in production of fuel and energy resources will contribute to its effective innovation-based development, production of high-tech products competitive on the domestic and foreign markets and provide an accelerated modernization of the coal industry enterprises.

**Analysis of recent researches and publications.** Problems of the institutional environment for innovation-based development of the industry with consideration of the branch features are investigated by many scientists, including O. Amosha, I. Buleev, V. Vyshnevskiy, A. Voronkova, V. Heyets, V. Holyan, T. Grynko, V. Dementyev, A. Zemlyankin, A. Kabanov, T. Kachala, Yu. Kindzerskiy, Yu. Kovalenko, L. Kuzmenko, T. Melnyk, K. Pavlov, Yu. Petrunya, L. Rassuzhday, L. Starychenko, D. Cherevatskiy, A. Chukhno, N. Chukhray, L. Fedulova, N. Shchepkina and others. The researches of leading scientists make up a scientific basis for developing the organizational and economic mechanism of institutional modernization of the coal

production. In this regard, the search for the ways of improving the institutional support for innovation-based development of the coal industry needs in further researches.

**Formulation of the task.** The purpose of this study is to work out the proposals on the formation of the institutional environment so necessary for innovation-based development of coal enterprises.

**The main material of the study.** The results of an international study in the sphere of innovation “Global Innovation Barometer 2012” conducted by General Electric confirmed that innovations are the key factors of the economic development, competitiveness and job creation. At the same time, they show that the unstable situation in the economic sphere can reduce the ability of enterprises to make robust innovative solutions [2].

The leading researchers note that “innovations do not have yet a sufficient impact on the economy, and the macroeconomic environment and institutional environment, in turn, hinder the innovative activity of enterprises” [3, p. 24; 4, p. 16].

The problems that hinder the effective innovation-based development include the “loss of markets for domestic high-tech products; poor attraction of funds to restore the clusters of high-tech industries; high cost of credit resources of banks and the inability to attract external funds to implement long-term innovation and technology projects in the industry; lack of financial resources and ineffective capital flow system; systematic failure to comply with financial terms for the implementation of the government target programs of the economic development; imperfect mechanisms for providing the economic stimulation of innovation and technological modernization of production; low purchasing demand for the national scientific achievements on the domestic market, as well the loss of its influence on the technological development of Ukraine’s production” [4, p. 16].

The Program of economic reforms in Ukraine for 2010 – 2014 “Prosperous Society, Competitive Economy,

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Effective State” states that “... scientific-technological and innovation sectors do not perform properly the role of sources of the economic growth”. It is explained by the fact that “the pace of development and the structure of the scientific-technological and innovation sectors do not meet the demand for advanced technologies of the economy” and “proposed world-level scientific results are not used in the economy because of the low receptiveness of business sector to innovation”. Among the reasons for the above problems is the “lack of economic incentives to carry out modernization through the introduction of new scientific and technological developments by business entities” [5, p. 49].

“There are still too many problems in the innovation sector... It is the increase in the innovation component that will make the economic development sustainable and the economy competitive...” [6, p. 24].

At the current stage of development, the activation of innovation processes in the economy, full use of the potential of science in the process of technological modernization of the domestic coal production are very urgent.

The analysis of innovation in the field of fuel and energy resources production in Ukraine showed that in

2011 the number of innovative enterprises in the branch increased by 33.3% as compared to 2005, the enterprises that implemented innovative products decreased by 80%; the enterprises that introduced innovations almost did not change (Table 1).

In 2005, the share of realized innovative products accounted for 1.5% of total volume of products realized in the sector of production of fuel and energy resources. Thus, since 2010 there hasn't been any realization of new innovative products both on the domestic market and outside Ukraine.

The analysis of the structure of the expenditures on innovative activities in the given sector says that it remains insufficient (Table 2).

In 2005 – 2011, most of the expenditures was allocated to acquire the machinery, equipment and software (the share of which ranged from 74.6% in 2005 to 89.9% in 2011 in the total volume of expenditures on innovative activities). The expenditures on research and developments were significantly less: from 24.1% in 2005 to 6.7% in 2011. To acquire new technologies, patents and licenses (other external knowledge), no more than 0.1% of the total spending on innovation was allocated.

Table 1

**Dynamics of innovative activities indicators in the fuel and energy complex of Ukraine**

Indicators	Years		
	2005	2010	2011
Number of innovation active enterprises	12	16	16
% of total number of enterprises in the industry	4,3	6,3	6,3
Number of enterprises that introduced innovations	11	8	10
% of total number of enterprises in the industry	4,0	3,1	3,9
Number of companies that realized innovative products	5	1	1
% of total number of enterprises in the industry	1,8	0,4	0,4

Source: [7, p. 179, 181, 183, 211-213, 226, 228, 232, 234, 236, 240 – 241].

Table 2

**The share of expenditures on innovative activities in the fuel and energy complex of Ukraine**

Areas of innovative activities	Years		
	2005	2010	2011
Research and developments <sup>1</sup>	24,1	3,5	6,7
Acquisition of machinery, equipment and software	74,6	93,9	89,9
Acquisition of new technologies <sup>2</sup>	–	0,08	0,09
Other areas	0,1	2,5	3,3

Remarks: <sup>1</sup> in 2010 – 2011 – external research works;

<sup>2</sup> in 2010 – 2011 – the acquisition of other external knowledge.

Source: [7, p. 189, 191, 193].

In 2005 – 2011, the main source of funding for innovation in the production of fuel and energy resources were enterprises' own funds, whose share was more than 84 – 97% in the total financing of innovative activity (Fig. 1). In 2000 – 2011, the share of funds from domestic investors decreased by 6.5% of the total financing of innovation in this industry. The volumes of budget financing of innovation in the production of fuel and energy resources were insufficient. In 2005 – 2010, their share increased by 4.7% and in 2011 dropped by 7.9% of total funding for innovation [7, p. 200, 202, 204].

In 2011, the activity of mining enterprises aimed at creating high technologies, using intellectual property and rationalization proposals, which are important components of innovation-based development, was not sufficient enough.

The total number of high technologies created in 2011 decreased by 30.8% against 2010 and amounted only to 9. As for the level of high technologies, only one of them was really new. In 2011, 10 titles of protection for high technology was received (in 2010 – 23), including 2 patents for inventions, 8 – for utility models. Only one of these titles of protection had non-infringement in other countries (in 2010 – 11) [7, p. 286; 4, p. 266]. The number of inventions used in 2011 was 22, utility models – 66, industrial samples – 6. In 2011, the mining enterprises used 338 rationalization proposals that by 12.7% less than in 2010 [7, p. 293, 295; 4, p. 273].

According to the State Statistics Service of Ukraine in 2008 – 2010, the share of mining enterprises having technological innovations in the most important areas of innovation related to the development and implementation of innovative products or processes is expressed as following: improvement of goods and services quality – 38.7% of all enterprises with technological innovations;

replacement of obsolete products and processes – 29.5%; increase in capacity to produce goods – 24.1%; entering new markets or increase of market share – 24%, expanding the range of goods and services – 23.6%; decrease in cost of materials and energy per unit – 20.3% [7, p. 273].

Based on the above analysis, the conclusion can be made that the fuel and energy complex has many problems that hinder its innovation-based development, in particular a high degree of depreciation of fixed assets (e.g., in the mining industry this figure was 47.8% in 2010) [8, p. 93]; the dependence of financial results on market situation, a large resource- and energy-intensity of the domestic industry, inefficient use of energy resources resulted in significant consumption of natural gas; a weak relationship between the national science and production; a low level of cooperation in the fuel and energy complex which prevents to establish rational channels for supplying companies with resources and full technological cycles for production of innovative products, etc.

Thus, in the current economic conditions the scale of innovation-based development in the sphere of production of fuel and energy resources in Ukraine is reducing. However, there are some reserves to increase its efficiency. According to the scientists of the Institute of Industrial Economics of NAS of Ukraine, “one of the main objectives of the present stage of economic development in Ukraine is to develop a competitive industrial complex of innovative type” [9, p. 3].

Scientists of the Institute of Economics and Forecasting of NAS of Ukraine stress that “the technological modernization of industry is impossible without a substantial intensification of innovative activity of its actors. Its intensity and effectiveness depend heavily on favorable institutional and macroeconomic

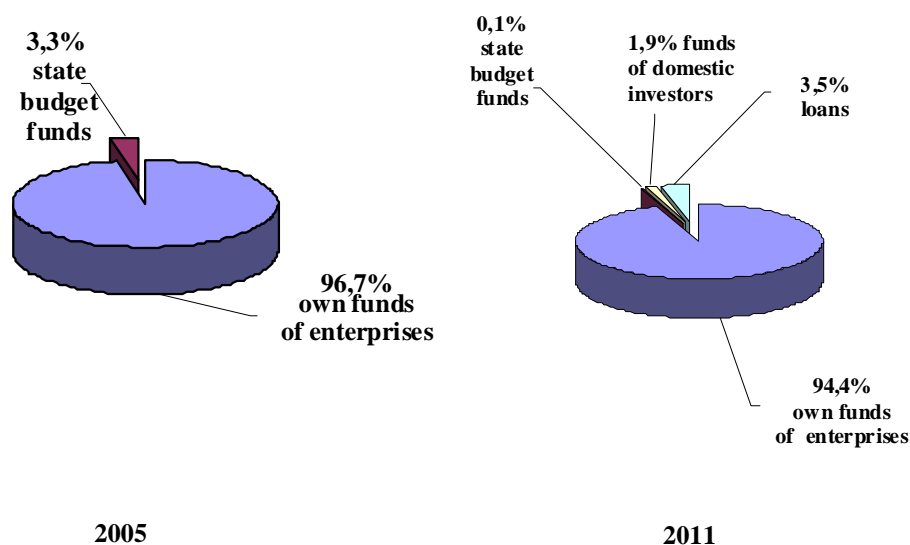


Fig. 1. The share of funding for innovation in the field of fuel and energy resources production in Ukraine

environment and market conditions, which, in turn, creates the appropriate motivation of the subjects to R&D; increase their resource-ability to implement the results of R&D, acquire new technologies and equipment...” [10, p. 36]. In their opinion, the priority measures should be the following: support of a sustainable economic growth on the basis of endogenous factors and development of production for domestic needs; the formation of a complete integrated national innovation system, some elements of which currently exist though in isolation from each other; the development and state support to the activity of subjects of innovation infrastructure (technoparks, technopolises, business incubators, science cities, science and technology centers, venture capital funds) [10, p. 36 – 37].

The specialists of the National Institute for Strategic Studies propose to improve the financial incentive mechanisms and institutional-legal support for innovation in Ukraine. To do it, the appropriate set of tools of government support to innovation should be developed which includes the establishment of institutions supporting innovative enterprises which acquire the assets up to 50% of the project’s cost through the open competition; structuring the system of public management of the innovation sphere using a functional principle and fixing its organizational structure on the legislative level; creation of the advisory body under the President of Ukraine to promote shaping and implementation of a unified government innovation policy in Ukraine; securing medium-term priorities of innovative activity on the national level within established long-term strategic priorities in order to concentrate scarce investment resources of the state on key priorities of development, eliminate the differences between the defined goals of the government innovation policy and actual measures to implement them [11].

The researchers of the Institute of Industrial Economics of NAS of Ukraine have identified the measures for financing the development and implementation of innovative projects based on the practical activity of leading industrial enterprises and results of expert survey. They include “ensuring an integrated systems approach to the development of innovative projects related to technical re-equipment of production, acquisition and introduction of a new high-tech equipment; the development and implementation of projects aimed at introducing new technological processes; development of investment projects to create new high-performance equipment by the enterprise’s specialists and exclusively new business processes; development of investment projects for industrial automation; financing of innovative projects to improve the quality, competitiveness and intellectual component of products that are produced by the enterprise” [12, p. 271].

Using practitioners and scientists survey, the priorities of innovation-based development of the coal

industry have been defined taking into account limited funding. They include technical re-equipment to increase the production and production capacity (51%), technical re-equipment of active production facilities to increase the production within a projected production capacity of the mine (26%) or orientation to the capital reconstruction or construction of new mines (23%) [13, p. 133 – 142].

According to the scientists of the Institute of Industrial Economics of NAS of Ukraine, “To provide the role of the domestic coal industry as a certain guarantor of energy security, the government policy should be aimed at addressing two global problems: technical and technological modernization of industry; reform of the industry according to market conditions. Concerning modernization of the material and technical base of the coal industry, it should go about the anticipatory strategy of innovation-based development, i.e., the mines should be re-equipped with modern highly productive and reliable equipment, and principally new, innovative products and mining technologies should be created which may eventually be required in the world market” [14, p. 26].

In the opinion of some researchers and practitioners, “To create a well-functioning domestic coal industry, a restricted restructuring and deep modernization of the mining fund on the basis of private-public partnership is needed”. “...Modernization should be carried out in the direction of integration of mines on the basis of centralization of lifts, improvement of technologies of works, and application of innovative means of mechanization” [15, p. 60].

In the framework of the research project of IEE of NAS of Ukraine “Developing the institutional environment for the industrial development in Ukraine with consideration of the branch features”, the proposals have been worked out to form the institutional environment for innovation-based development of the coal industry. They are:

clarifying the content of the institutional environment for innovation-based development of the coal industry as a set of standards and rules in the sphere of innovative activities of mining enterprises which are regulated by the legislative, departmental and branch regulations and documents, as well as of the economic relations which are regulated by innovative structures and infrastructure institutions in order to reduce transaction costs for technologies transfer and make advanced solutions in the sphere of innovative activities;

disclosing the main components of institutional support to innovation-based development of the coal industry which include the legislative and regulatory base; institutes regulating the economic relations in the sphere of innovative activities of mining enterprises; national and regional authorities in the field of innovative activities;

identifying the ways of improving the institutional support to innovation-based development of the coal industry which include the issues concerning the formation

of institutions that regulate the innovative model of modernization and development of the coal industry, the increase of the industry's competitiveness, liberalization of the coal market, attraction of private investment resources, determination of the fair rent for the use of mineral resources, privatization, environmental security, prestige of miners' work, improvement of management efficiency, etc.

The priority directions of the scientific-technical and innovative activities of enterprises of the coal industry, which are based on the "Concept of the draft national target program for the development of Ukraine's industry till 2017", are the following (Fig. 2).

Now, let's characterize each of the above directions:

1. Stimulation of technical re-equipment, determination of the economic effect from technical re-equipment.

2. Financing of new technologies introduction, determination of the economic effect from the introduction of new technologies.

3. Encouragement of measures aimed at the coal enrichment, certification of products, introduction of the international quality system ISO 9000 at enterprises, control and monitoring of coal products quality.

4. Financing of new technologies and equipment development, regulatory and information support to innovation-based development of the coal industry.

5. Financing of the program on creation of domestic competitive mining equipment, assessment of competitiveness of domestic mining equipment.

6. Stimulation of scientific support to technological processes.

7. Improvement of laws and regulatory acts related to scientific-technical and innovative activities, social protection of researchers, intellectual property and government target programs, providing funding for development of science and techniques having priorities for innovation-based development of the coal industry, organization of competitions of scientific developments under the auspices of the Ministry of Energy and Coal Industry with allocation of money for further research and development.

8. Making amendments in the national legislation on transfer of costs for the restoration of the material and technical base of the branch science from the taxable income, increase of places in post-graduate and doctoral courses in technical specialties ordered by the state.

**Conclusions.** To solve the problem of finding financial sources for innovative activities, it is necessary to simplify the relevant laws, grant privileges, create private capital, and provide advanced training of scientific personnel through the improvement of remuneration system for scientists. The problems of providing innovative activity of coal enterprises due to the improvement of methodical recommendations on preferential taxation, insurance of investment projects, which should be applied at enterprises, and the use of international experience in supporting innovation processes are of great urgency.

According to calculations of experts, the implementation

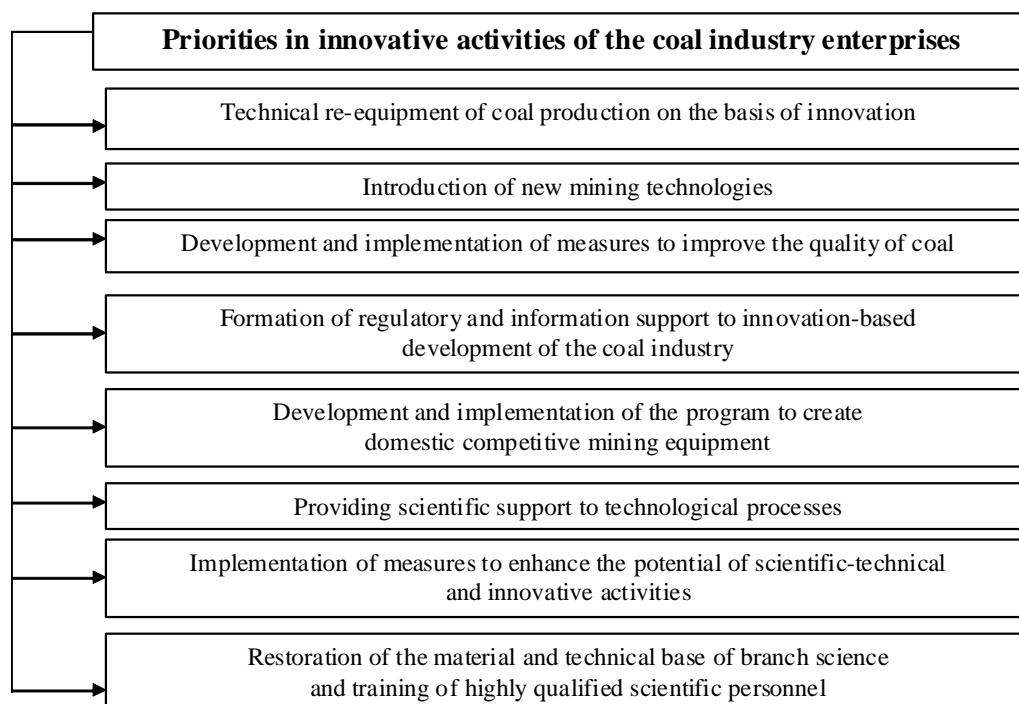


Fig. 2. Priority areas of scientific and technological and innovative development of coal enterprises

of proposals on the improvement of institutional support to innovation-based development of industrial production will allow increasing the share of innovation active industrial enterprises by 14,3% and the level of science-intensity of GDP by 0,6% due to all sources of financing.

The above ways of improving the institutional support to innovation-based development of the coal industry enterprises will contribute to the formation of innovation infrastructure, increase of the economic and financial incentives and government financing of priority innovative activities, creation of the information environment, strengthening of scientific and regulatory support to innovations of the mining industry.

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### **Драчук Ю. З., Трушкіна Н. В. Формування інституціонального середовища інноваційного розвитку вугільних підприємств**

У статті проаналізовано основні показники інноваційної діяльності вітчизняних підприємств у сфері видобування паливно-енергетичних копалин. Розроблено пропозиції щодо формування інституціонального середовища інноваційного розвитку вугільних підприємств.

*Ключові слова:* інституціональне середовище, інноваційний розвиток, вугільне підприємство.

### **Драчук Ю. З., Трушкіна Н. В. Формирование институциональной среды инновационного развития угольных предприятий**

В статье проанализированы основные показатели инновационной деятельности отечественных предприятий в сфере добычи топливно-энергетических ископаемых. Разработаны предложения по формированию институциональной среды инновационного развития угольных предприятий.

*Ключевые слова:* институциональная среда, инновационное развитие, угольное предприятие.

### **Drachuk Yu. Z., Trushkina N. V. Forming the Institutional Environment for Innovation-based Development of Coal Enterprises**

The study analyzes basic indicators of innovation-based development of domestic enterprises in the field of fuel and energy resources production. The proposals have been worked out to form the institutional environment for the development of coal enterprises.

*Key words:* the institutional environment, innovation-based development, coal enterprise.

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