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## PROBLEMS AND PROSPECTS RESEARCH FOR HUMAN RESOURCE DEVELOPMENT FOR FUEL AND ENERGY COMPLEX OF UKRAINE

### ДОСЛІДЖЕННЯ ПРОБЛЕМ ТА ПЕРСПЕКТИВИ РОЗВИТКУ ЗАБЕЗПЕЧЕННЯ КАДРОВОГО ПОТЕНЦІАЛУ ПАЛИВНО-ЕНЕРГЕТИЧНОГО КОМПЛЕКСУ УКРАЇНИ

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*Смоквіна Г.А., Левицька А.В., Гриценко А.А. Дослідження проблем та перспективи розвитку забезпечення кадрового потенціалу паливно-енергетичного комплексу України. Науково-методична стаття.*

Стаття присвячена дослідженню сучасного стану кадрового забезпечення енергетичних підприємств, проблемам критичного відтоку кваліфікованих фахівців та «старіння» кадрів паливно-енергетичного комплексу. Проаналізовано тенденція зміни чисельності висококваліфікованих працівників в паливно-енергетичному комплексі за останні роки. Охарактеризовано європейський досвід запобігання нестачі спеціалістів та системи якісної підготовки кадрів в галузі паливно-енергетичного комплексу. З'ясовано основні причини непопулярності даної галузі для молоді та досліджені основні методи боротьби з даною проблемою українських та зарубіжних підприємств. Запропоновано основні шляхи боротьби з кадровим «голодуванням» та напрями їх підвищення, на рівні країни, престижу наукової роботи в галузях паливно-енергетичного комплексу.

*Ключові слова:* кадрове забезпечення, паливно-енергетичний комплекс, освіта

*Smokvina G.A., Levytska A.V., Grycenko A.A. Problems and prospects research for human resource development for fuel and energy complex of Ukraine. Scientific and methodical article.*

The article is devoted to the study of the current state of energy enterprises staffing, the problems of qualified specialists' critical outflow and the personnel "ageing" of the fuel and energy complex. It has been analyzed trends in the number of highly skilled workers in the fuel and energy complex in recent years. The European experience of preventing the specialists' shortage and the of high-quality training system in the field of the fuel and energy complex has been characterized. The main reasons for the unpopularity of this industry for young people have been elucidated and the main methods of dealing with this problem of Ukrainian and foreign enterprises have been investigated. The main ways of combating personnel "starvation" and directions for their improvement, at the country level, the prestige of scientific work in the sectors of the fuel and energy complex have been proposed.

*Keywords:* staffing, fuel and energy complex, education

**M**odern electric power industry enterprises operate in rather unfavourable conditions, which adversely affect their activity and are associated with constant changes in the external and internal environment. Today all the world's electric power industry is experiencing a sharp staff shortage and the need for people's fundamentally new knowledge and skills. In recent years the insufficient attention amount is paid to the issue of scientific and technical and personnel supply has led to a clear slowing down of the scientific and technical potential development of the fuel and energy complex (FEC). If this trend continues, it is likely to become an obstacle to the indicators achievement laid down in the Energy Strategy and the further successful growth of the FEC industry.

#### Analysis of recent research and publications

The research of the electric power industry and its peculiarities, which determine the peculiarities of the energy enterprises operation, are devoted the investigations of many domestic and foreign scientists, namely L. Hitelman [1], B. Papkov [7], A. Tukenov [10], V. Fortov [11], A. Levytska and others. At the present stage of Ukraine's fuel and energy complex (FEC) development the issue of human resource personnel training for energy companies, in our opinion, requires a detailed study. The investigations H. Hohl [13], Ye. Oshyn [6], V. Kharchenko [13], V. Skliar are devoted the of partnership relations development between enterprises and institutions of higher education. The research analysis shows that there is no special work devoted

to the training system formation for the higher qualification for the electrical engineering industry.

*The aim of the article is to study the human capacity status and outward flow problems of qualified specialists of Ukraine's fuel and energy complex. To analyze the changes and determine the trend in the employees number in the fuel and energy complex. To describe European and national experience in methods of combating a certain problem. On the conducted research basis, to propose the main measures to combat staff shortage and directions for their increase.*

### The main part

The scientific and scientific-technical branches provision is currently carried out by institutions and organizations of various departmental subordination, namely:

- Ministry of Energy and Coal Industry;
- National Academy of Sciences;
- Ministry of Education and Science and others.

The main tasks performed by such ministries and departments are:

- ensuring the effective use of technical and intellectual potential of sectoral organizations;
- technological and scientific and technical support of the industry.

According to the statistical data analysis for the first 10 years of the XXI century scientific and technical studies were carried out:

- 55-65% – in trade organizations;
- 20-30% – in academic institutions;
- 10-15% – in higher education institutions;
- 5% – in factory organizations.

According to the research in the field of scientific and technical and staff assistance to the fuel and energy complex, there are several important issues.

Firstly, with the growing demand for labour, skilled workers shortage is growing, which is noticeable for all Ukraine's enterprises and levels of FEC. As far back as in the 90s of the last century, the engineering staff shortage began to emerge in the country. It is related to the fact that the prestige of the engineering business reduced due to its low social status and low wages. As a result, the number of engineering students is decreasing. Also, the education quality was significantly influenced, as the specialties structure, which are trained by future specialists of Ukrainian universities, do not meet the market needs as a whole and the FEC industry. As a result, today in our country it is quite difficult to satisfy the need for engineering staff. The above-mentioned problems, in the end, has led to a significant ageing of engineering-technical staff of Ukraine's fuel and energy complex. The average age of qualified specialists in this area is in the range of 45-65 years; the smallest share of employees at the FEC enterprises has the age group of 35-45. It should be noted that for young people under 35 this sphere is less popular. Such a negative tendency is dangerous, as there is a high risk of a significant reduction in the human capacity of the country's energy sector [4].

As we see from the tab. 1, the number of full-time employees in general in industry in 2019 has increased significantly, however, the fuel and energy sector has experienced a negative trend throughout the investigated period, which confirms the personnel potential reduction of the country's energy sector.

Table 1. The number of regular employees in Ukraine's industry in 2017-2019, thousand people

Activity type	2017	2018	2019
Industry	1893.7	1867.9	1907.0
Supply of electricity, gas, steam and air conditioning	300.4	296.3	292.0

*Source: compiled by the authors on materials [2]*

Secondly, besides the fact that there is scientific and technical staff reduction, very little attention is paid to the development of scientific and technical support of the energy sector. According to the State Statistics Service of Ukraine, the number of institutions of the Ministry of Education and Science, Youth and Sports of Ukraine performing scientific and technical work has decreased from 152 (2000) to 150 (2009) and 144 (2010). Over the past 15 years, the number of employees who conducted research at universities was regularly reduced. So, if we compare, in 2009 scientific and scientific and technical work involved 7267 specialists, and in 2010 only 7092 [2].

One of the main reasons for reducing the number of experimental studies of important areas in Ukraine's FEC is the lack of funding. Only 2% of scientific equipment of the country's scientific and technical institutions correspond to the modern European level. Only about 6% of the equipment can be attributed to the new one, and the fixed assets

depreciation in this sector exceeds 46% with an update factor of no more than 1-1.5% per year. This significantly impedes the emergence of competitive developments [9].

According to experts, Ukrainian energy, first of all, generating companies, is waiting for personnel "deficiency".

At the moment, in the electric power industry the average age of specialists is over 54 years. This demonstrates the low level of a new personnel reserve formation and a significant ageing of specialists. A very vivid example of one of the good reasons is the introductory companies of 2016-2018 years. A very vivid example of one of the good reasons is the introductory campaigns of 2016-2018 years. The low number of entrants to higher technical institutions demonstrates minimal interest in engineering and, especially, in the energy specialty. In addition, recruiting companies and HR departments have highlighted the low graduation output, compared with

the current technological needs of the technology business. The reason for the low development of Ukrainian science is the minimal involvement of the private sector in its financing. About 95% of fundamental research is funded by state and local budgets. However, applied researches about one-fourth are funded by the private sector, but even this index cannot be considered sufficiently positive.

The energy market participants in the European Union invest specifically in education.

German TEN Transmission System Operator (TSO) Gesellschaft mit Beschrakter Haftung (GmbH), Ampiron GmbH, 50Hertz Transmission and EnBW Transmission and the German energy company E.ON SE actively interact with universities and spin-offs. Each of the companies has joint training programmes and research laboratories with specialized technical universities. Due to the "presence" of businesses in educational institutions, companies dictate their skills and knowledge requirements, as a part of the qualifications that graduates should have for employment in energy companies.

Unlike Ukrainian, foreign companies provide universities with branded audiences and laboratories that shape students' corporate spirit and style.

The experience of the French state energy company Electricite de France deserves special attention. Having its own network of universities with specialized departments and laboratories, they contribute to the quality training of industry experts in the field of electricity for the whole country. The system operator and the generating company are thus forming a constantly renewed staffing reserve for the whole energy sector of the country. If we consider Poland's experience, the country also has successful examples of adjusting the curricula to the current requirements of the electric power industry. The change in the educational programmes of six technical universities was significantly influenced by the initiative of Smart Grid European Technology Platform. For example, in Poland, due to the of solar power generation development, there was a demand for specialists in the photovoltaic panels installation. Secondary specialized education has responded to this request. So, the direction of preparation "Solar power systems installation" was opened simultaneously in 28 vocational schools.

If we talk about Ukrainian experience, DTEK is to be highlighted first of all. In 2010 it opened its own corporate university – the "DTEK Academy". This project is the company's internal platform, with which DTEK promotes modular education programmes for senior executives, strategic sessions and staff coaching. The academy has no influence on the existing qualification framework in the field of energy, but has already worked with the university graduates [8].

According to the unfortunate experience, one can give an example of the the project implementation "Unconventional Gas Institute Project" in eastern Ukraine. It was launched during the development of Shell gas exploration projects for sealed sandstone.

Teachers from universities, in the project framework, have completed their studies in England, curricula and textbooks were developed for their methodological support. Also it was opened the laboratory "Eco-geochemistry of non-traditional gases", which had modern equipment. However, in Ukraine, the project was subsequently closed.

World System Builder (WSB) Green Energy is a German leader in power generation. It initiated the creation of a dual diploma programme between Ukrainian and German universities to train specialists before starting to implement investment projects in Ukraine. Graduates will have all the knowledge and skills, which meet the European standards for doing business.

On the official site of the State Enterprise "NPC" Ukrenergo" on 21 March 2019, information about the support of the joint initiative by the Ministry of Education and Science of Ukraine, the Centre for Corporate Social Responsibility Development and the United Nations Population Fund – "Ukrainian Youth Pact for 2020" was published. The aim of this event is to facilitate a solution to the problems of education and young people's employment. The issue of modernizing and promoting energy education for Ukrenergo is one of the priorities, because the future of the Ukrainian energy industry depends on young specialists [8].

For Ukrenergo participation in the Covenant is an opportunity to realize young people's the potential in the electricity sector in Ukraine, as well as to provide the industry with new highly-qualified personnel, competitive not only in the Ukrainian but also in the European market.

The company has already signed memorandums and cooperates with Igor Sikorsky Kyiv Polytechnic Institute, Institute of International Relations of Taras Shevchenko National University of Kyiv, O.M. Beketov Kharkiv National University of Economics. Together with the latest it has been developed a master's programme "Trunk Electric Networks: Management, Operation and Development", a curriculum has been worked out together with Ukrenergo specialists and already held author lectures. Another company's sign project is Ukrenergo laboratories, which has already captured thousands of participants. It is a driver for the innovative projects development in the Ukrainian electricity industry [3].

The most widespread cause of personnel shortage and turnover is low wages. However, by examining average wages for industry and for Ukraine in the average, one can notice that in the fuel and energy industry it is at a rather high level (tab. 2 and fig. 1) [3].

The average wage growth for the electric power industry employees during the researched period was 55% [5].

The salary level calculation is made in accordance with the Procedure for determining the labour costs that are taken into account in the tariffs for the electric energy distribution (transmission of electric energy by

regional (local) electricity grids), electricity supply at regulated tariffs, electric energy transmission to trunk and intergovernmental electric grids, production

thermal and electric energy production, approved by the resolution of EUNRC from 26.10.2015 № 2645, registered with the Ministry of Justice of Ukraine [5].

Table 2. Average monthly wages by type of economic activity in 2017-2019 (per employee, UAH)

Activity type	2017	2018	2019
Supply of electricity, gas, steam and air conditioning	8493	10790	13162
Industry on average	7631	9633	10877
In Ukraine on average	7104	8865	9392

Source: compiled by the authors on materials [2]

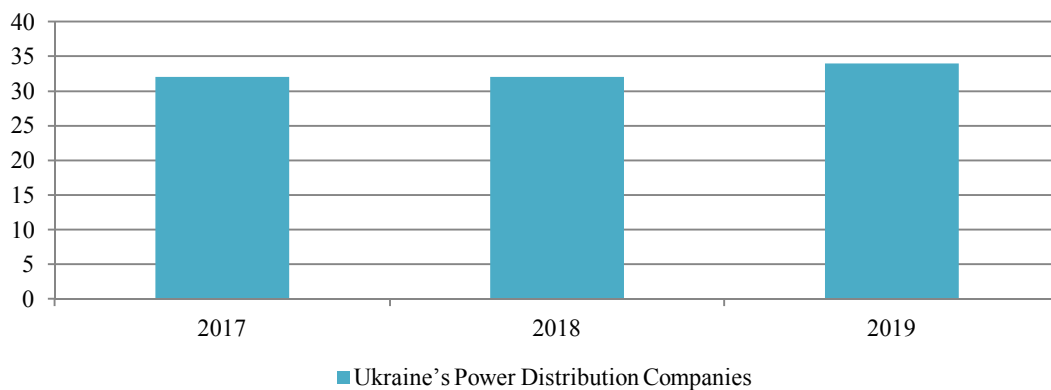


Fig. 1. Trend in the number of Ukraine's power distribution companies in 2017-2019 (as of January 1)

Source: compiled by the authors on materials [5]

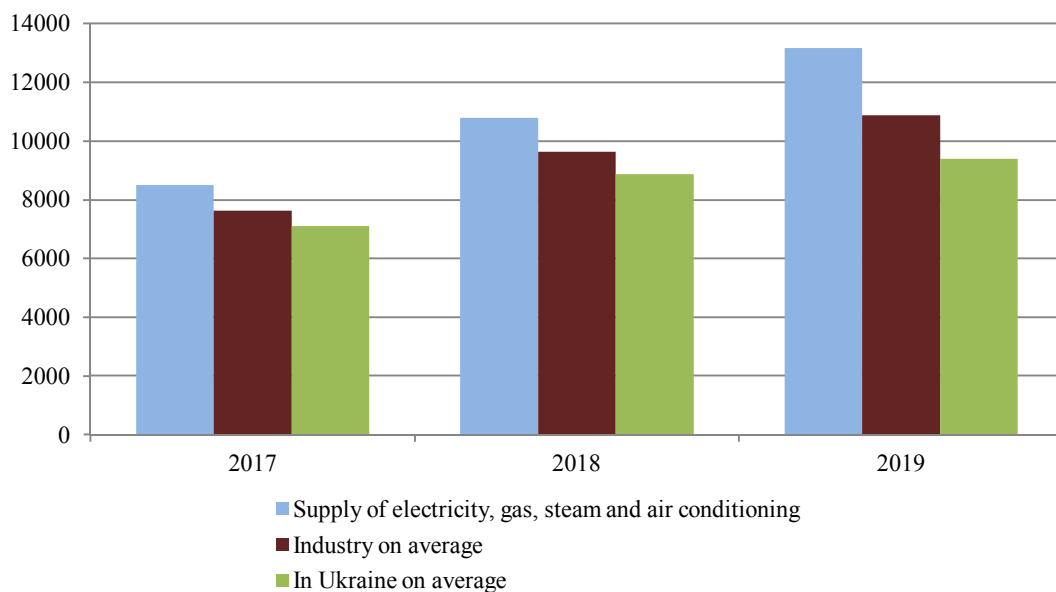


Fig. 2. Average monthly wages by type of economic activity in 2017-2019 (per employee, UAH)

Source: compiled by the authors on materials [5]

In 2018 at an open meeting of the National Commission for State Regulation in the fields of energy and utilities were approved the draft decisions on the structures revision and levels of tariffs for the production, transmission, distribution and supply of electricity in connection with the increase in wages to employees [5].

As we can see from the fig. 1, there were 2 new power distribution companies in 2019, but this did not

cause the growth of the average monthly wage. The said decision was made with the purpose of preserving companies' qualified human resources and ensuring the reliable operation of the United Energy System of Ukraine, as well as providing high-quality and reliable electricity to consumers. The Commission ordered the energy companies to direct an increase in the wage fund to raise wages for production and technical personnel.

An important factor for the sustainable development of Ukraine's power industry is the a sufficient level achievement of scientific and technical and personnel support for the branches of the fuel and energy complex in the long-term perspective. In order to provide energy companies with the latest scientific and technical developments that will meet the European level, to overcome the shortage of scientific and skilled engineers and technical staff, and to increase the interest of young professionals in the industry, the following measures are needed to start:

- to provide sufficient funding for branch science;
- to ensure the research works implementation devoted to the fuel and energy complex development and their further practical application;
- to increase the scientific work prestige in the field of technical sciences at the country level, to attract attention to the scientific personnel training of higher qualification through the network of postgraduate and doctoral studies at academic and sectoral institutes and universities;
- to coordinate programmes of specialties with the needs of the fuel and energy complex branches;
- to increase the engineering and technical specialists qualification in the fields of fuel and energy complex for the development of modern production technologies, legal issues and investment management;
- to encourage the fuel and energy complex enterprises to increase the social guarantees system and to ensure safe working conditions;

To attract extra budgetary funds and venture capital for innovative projects realization, the latest developments in energy introduction, as fast as possible organization of production and new high-tech products promotion.

## Conclusions

An important factor for the sustainable development of Ukraine's electricity industry is the sufficient level achievement of scientific, technical and personnel support for the branches of the fuel and energy complex for the long-term perspective. The decision of the current situation on the market is the close interaction between energy companies and institutions of higher education, the development of joint curricula and focus on students' practical experience. It will allow the energy companies to provide the latest scientific and scientific-technical developments that will meet the European level, overcome the shortage of scientific and skilled engineering and technical personnel and increase young specialists' the interest in the industry.

For qualitative training of specialists it is necessary to take into account the parameters of the specifics of the branches of the fuel and energy complex, the basic requirements for skills, experience and knowledge of the future employee. For efficient interaction of energy companies with higher education institutions, it is necessary to assess the readiness of the business sector to regularly allocate funds for students' study, the level of technological equipment at the enterprises of the FEC and quality standards of energy services.

Thus, activating the interaction between the energy company and the HEI will improve the situation on the labour market and provide the enterprises with the necessary engineering personnel. Among the prospects for further inquiries in this area, it is advisable to investigate the personnel retraining process development in newly created energy companies formed as a result of regional oblenergos unblding.

## Abstract

Modern electric power industry enterprises operate in rather unfavourable conditions, which adversely affect their activity and are associated with constant changes in the external and internal environment. Today all the world's electric power industry is experiencing a sharp staff shortage and the need for people's fundamentally new knowledge and skills. In recent years the insufficient attention amount is paid to the issue of scientific and technical and personnel supply has led to a clear slowing down of the scientific and technical potential development of the fuel and energy complex (FEC). If this trend continues, it is likely to become an obstacle to the indicators achievement laid down in the Energy Strategy and the further successful growth of the FEC industry.

An important factor for the sustainable development of Ukraine's electricity industry is the sufficient level achievement of scientific, technical and personnel support for the branches of the fuel and energy complex for the long-term perspective. The decision of the current situation on the market is the close interaction between energy companies and institutions of higher education, the development of joint curricula and focus on students' practical experience. It will allow the energy companies to provide the latest scientific and scientific-technical developments that will meet the European level, overcome the shortage of scientific and skilled engineering and technical personnel and increase young specialists' the interest in the industry.

In the course of the research, it was found out that for qualitative training of specialists it is necessary to take into account the parameters of the specifics of the branches of the fuel and energy complex, the basic requirements for skills, experience and knowledge of the future employee. For efficient interaction of energy companies with higher education institutions, it is necessary to assess the readiness of the business sector to regularly allocate funds for students' study, the level of technological equipment at the enterprises of the FEC and quality standards of energy services.

The article examines the state of human resource and problems of qualified specialists' outflow in the fuel and energy complex of Ukraine. The changes have been analyzed and the trend in the number of employees in the fuel and energy complex have been determined. The European and national experience in methods of combating a certain problem has been described. On the basis of the conducted research the main measures of struggle with personnel "deficit" and directions of their increase have been offered.

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