Russian hydropower sector and its human resources under digitization conditions

Natalya Ketoeva 1, Natalya Soldatova 1, Nadezhda Rebrikova 2 and Svetlana Ilyashenko 3*

1 National Research University “Moscow Power Engineering Institute”, Krasnokazarmennaya str., 14, Moscow, 111250, Russia
2 Financial University under the Government of the Russian Federation, Leningradskij av., 49, Moscow, 125057, Russia
3 Plekhanov Russian University of Economics, Stremyannyj lane, 36, Moscow, 115054, Russia

* E-mail: svetavol@yandex.ru

Abstract. This study considers the issues regarding qualitative transition of the economy to an innovative development way as part of the main demographic trends in the labor market. In particular, in the market segment where the electric generating companies of the energy industry are operating, the specificity of the PJSC RUSHYDRO labor resources quality was studied and the practical personnel training and development for the industry was assessed by the leading university of the country, State Federal-Funded Educational Institution of Higher Professional Training National Research University “Moscow Power Engineering Institute” (SFFE IHPT NRU “MEI”). This paper has investigated some aspects of innovative processes in the energy industry, which are hindered by a whole system of restrictions. These restrictions include negative trends associated with the formation of domestic scientific potential. The innovative vector of strategic development of energy companies dictates new requirements of employers for the quality of personnel training and retraining. The authors proposed an algorithm for the organization and development of educational and practical activities of the university for Russian research and production companies in the electric power industry.

1. Introduction

The purpose of this study is to identify two groups of problems and find approaches to their solution, namely: quality assessment of labor resources employed in electric power generation in the long term prospects and factors affecting the efficiency for formation of qualitatively new labor resources that shape the innovation economy.

The tool and methodological system is based on general scientific methods: induction, deduction, and elements of system analysis for processes of sociology development in the field of electric power industry based on quantitative and qualitative research methods. In addition, methods of logical, statistical and situational analysis are used.

The information and empirical base of the study consists of the authors' previous papers on this topic [1, 2], as well as the information Internet resource of PJSC RUSHYDRO [3], which annually publishes open statistical data on this company. It is worth noting that the authors' study is carried out
in a dynamic retrospective: for example, for analysis of labor resources, the period was chosen from the moment of structural reforms in the energy sector and the creation of state-run energy companies, such as from 2004 to 2017.

The methodology of a sociological study of labor resources in the electric power industry is a comprehensive model to simulate the processes describing the state, development, and prospects of this labor market segment. The methodological aspects of the analysis, including the fundamental principles, methods for organization and conclusion of a sociological research are monitoring of the external and internal environment, allowing to identify problems of research and to generate the objective.

2. Prerequisites for transformation of requirements to labour resources
The Russian model of innovative development of the electric power industry, which may exist under conditions of economic uncertainty, is the formation and use of the national innovation potential. In terms of the innovation economy (knowledge economy), this model is especially important. Effective development of the electric power industry requires providing the most possible compliance of the employees’ qualifications and knowledge with the requirements specified in modern realities. The employer is interested in the employee’s qualifications, his/her ability to perform specific functions. The companies’ peculiarity in the electric power industry is that the presence of a diploma or other formal service recognition of a potential employee is of fundamental importance in case of employment.

The principal transformation of all aspects of the Russian society life takes place in the dynamics of population, man as the main catalyst to improve the society in the 21st century, and at the same time in the development of the individual, as the ultimate goal of social progress. Demographic changes occurring at the national level are expressed in the formation of two trends: with decreasing in the birth rate, the problem of employment remains acute, and, secondly, the deterioration of the population age structure leads to decreasing in its innovativeness.

The focus of Russian society on the innovation economy development makes high requirements for the labor market in general, highly skilled labor, in particular. New employers’ requirements for the labor market form the demand for services of the educational sector. Participants in the labor market and the educational services sector are the institutions which determine the qualitative component of the innovation economy.

In modern conditions, it is extremely important to understand what qualitative and quantitative requirements are specified for the staffing of the Russian economy, and how the vector of world science and technology breakthrough and economic progress will affect the development of scientific schools, the synthesis of academic and industrial science of higher school.

The country's labor resources, their quantitative and qualitative characteristics are the productive factors for society development as a whole, the main factor of sustainable development of the economic system.

3. Features of labour resources preparation for the energy sector
The advanced development of the energy sector, predominance of energy-saving production, development of new generation technologies, energy transmission and use are the basis for acceleration of economic growth of the country and regions. The serious problem for Russia is the potential possibility of labor resources shortage in the medium term prospect. Drastic changes in the energy industry strongly dictate the transformation of labor requirements. The main characteristics of the new approach to the labor resources of the industry are as follows: the impossibility of replenishment of the labor resources shortage due to the influx of migrants into the energy sector; filling the vacancies in the energy sector, as well as in the high-tech sectors of the economy, imposes the increased requirements for fundamental knowledge; over the past decades, the focus of energy companies has been aimed at the use of existing labor resources. In modern conditions of widespread use of ICT, human capabilities to provide labor services are coming to the fore, and the main task of
modern enterprises is the formation of qualitatively new labor resources and the methodology for their economic evaluation; the development of sociological and economic theory and practice led to the understanding that when assessing the available labor resources it is important not only to analyze their economic efficiency, but also to assess and form a certain level of professional knowledge, the ability to solve problem in an optimal way, maintain a certain level of corporate culture, education, etc. These criteria allow an individual to adapt more quickly to the market requirements.

In view of the above trends, the organization and conducting of sociological research in the labor market for the electric power industry allows to get a fair presentation on the current situation, existing trends and forecast the indicators of labor resources in the future.

The development of the Russian post-industrial society is inextricably connected with the dynamics of population, the qualitative development of labor resources which is the main force of social progress. The demography trends form the “framework” conditions to determine the number and quality of labor resources in the energy sector [4].

For Russia, due to the climatic conditions and other factors, the key direction of the country's economic development is the energy industry transformation, which is the largest source of GDP and provides millions of people with jobs. The electric power industry belongs to the high-tech industry; therefore, the personnel competence and professionalism are extremely important. The shortage of highly skilled workers in the electric power industry cannot be compensated by the flow of migrants. Various forms of motivation can attract the most qualified personnel to the electric power industry and offer consumers a high-quality service [5].

Modern society is a society based on the services, where the main trend is the growth of the services sector: education, health care, management, information technology, etc. The vector of social change before the society is based on a new principle of social and process organization and a new attitude towards a person in the state. Such an approach puts theoretical knowledge at the forefront as a renewal source and changes the nature of process progress. Professional knowledge, qualifications, general theoretical understanding and skills form an individual's quality labor and provide the possibility of effective functioning.

4. Primary trends in the labour resources training for the energy sector

The published demographic data allow identifying new trends in the dynamics and structure of the population of the Russian Federation, which in turn influenced the labor market segment of the energy industry. The depopulation crisis typical for the electric power industry forms deterioration in the age structure of labor resources and, as a result, reduces their creativity and innovativeness. Thus, in PJSC RusHydro [3] there is a clear tendency to increase the share of working pensioners from 5.4% in 2005 to 6.7% in 2017, although this indicator had a certain volatility in different years. The share of personnel under the age of 30 years increased slightly (from 26.7% in 2005 to 27.2% in 2017). The highest growth rates were demonstrated by the share of personnel aged 30-50 years (from 32.1% in 2005 to 36.5% in 2017). A number of the age group over 50 years old shows multidirectional trends. On the one hand, a share of this group in the overall staff structure has significantly decreased (from 42.1% in 2005 to 36.3% in 2017); on the other hand, a share of working pensioners in this group increases (from 5.4% in 2005 to 6.7% in 2017).

A significant share of the company's personnel structure is employees in the age group of 30–50 years and over 50 years (more than 2/3 of personnel number in total), which indicates the involvement of employees having a large practical experience in the industry and competencies. This is due to the influence of such factors as high requirements for the professional behavior of employees who are not yet formed in the younger age group of company’s employees.

One of the required conditions for development of high-tech energy sector is the rise in the efficiency of labor resources, along with a set of measures aimed at forming an employee who has not only a high level of qualification, but also extensive theoretical knowledge, practical skills and a range of ethical principles. The data of PJSC RusHydro shows an increase in the employees share with higher education: from 47.9% in 2005 up to 80.3% in 2017. Thus, the increasing requirements for the
theoretical knowledge level strongly dictate terms for obtaining a complete higher specialized education.

The company has optimized the staff for the analyzed period that is the all-Russian trend of the most manufacturing companies, including the companies operating in the energy sector. Staff reduction was made possible by outsourcing the company a number of services, including non-core activities such as cleaning and repair. A staff number in 2014 decreased by 7.9% that is due to the management system improvement in the executive office and the personnel withdrawal of transport sections in branches.

The energy companies’ growth and development are based on investments in productive facilities of an enterprise and the use of innovative management technologies, which means an attempt to solve the problems of the labor resources quality through the managerial work intensification. The development of information technologies, the creation of global information systems cannot affect the cost of productive-facility of an industrial enterprise, including in the energy industry. An investments volume which is necessary for the transformation of the productive-facility in the energy industry can reach up to trillion rubles in the coming decades. The search for the required scope of financial resources is a problem both for enterprises and for the industry as a whole.

One of the criteria allowing to assess the quality of labor resources is the employment assessment in the main types of professions (a share of employees engaged in management and auxiliary activities) in comparison with other sectors. For example, at the Russian enterprises of electric power industry a share of administrative and management personnel is significant. In addition, a ratio of engineers and workers in energy companies is a certain bias towards workers that does not correspond the global trend.

It is impossible not to take into account the trends and structural changes that determine the architecture of world energy markets, as well as appearance of new technologies as a factor of transforming the institutional markets structure [6].

5. Discussion
The energy sector is one of the most priority sectors in the national economy development. According to Rosstat, an average annual number of people employed in the energy sector is less than 3% of the total number of people employed in all types of economic activity. The specific nature of personnel training for the electric power industry is such that the modern employee is required to master the sophisticated process equipment and the latest technologies in addition to fundamental theoretical training. Currently, the issues of training high-quality personnel for energy are quite important. A modern specialist in the process of training should gain not only theoretical knowledge, but also quite specific practical skills [7, 8].

The policy of public education testifies to the constant attempts of reforms in this area, including higher education [9, 11]. Such changes require further training of teachers who train personnel for the energy industry [10], which dictates the need to strengthen relations with energy companies [12] and to introduce using of real enterprise equipment and information programs on company management into the training process.
6. Conclusions

In the framework of this study, the following results were obtained. The imperative of the economy innovation orientation is a qualitative increase in the educational level in the market of highly skilled labor. The growing role of the education sector for energy companies is due to the fact that innovations represent not only improvements in the applied nature, but also the results of fundamental research.

Current state analysis of the labor market segment, which was formed for the energy industry, identifying the main trends in it, made it possible to formulate recommendations on the definition of strategic guidelines for development of personnel training, taking into account market conditions and the energy sector specific. Knowledge of the trends in development of the energy industry and national demographic trends and company PJSC RUSHYDRO development priorities allows to gain strategic advantages in the market.

The basic research results introduction into the production process by the electric power generating companies leads to an increase in professional competencies and knowledge, which accordingly leads to an increase in the requirements for highly skilled employees. The formation of the highly qualified specialists market determines the labor market vector and its dynamics under conditions of the innovative orientation of the economy.

References

[1] Soldatova N F 2015 Economics and management in mechanical engineering 6 26–27
[2] Gudkova E E, Kurdukova G N and Ketoeva N L 2017 Economics and entrepreneurship 2-2 (79-2) 671–674
[3] Official website of Joint Stock Company Rusgidro, http://www.rushydro.ru/
[4] Official website of Consulting center Doctor of Medicine: https://nmatrening.ru/health-management
[5] Analytical portal Branches of law, http://отрасли-права.рф/article/5493
[6] Telegina E A, Eremin S V, Katuha P B, Bessel V V, Salahov I I, Kanayama R D and Sultanov E R 2017 Oil, gas and business 10 43–52
[7] Official website of Rating agency “Expert RA”, https://raexpert.ru/rankings/vuz/vuz_2018
[8] Official website of National Research University “Moscow Power Engineering Institute”, http://mpei.ru/Pages/default.aspx
[9] Klyachko T L 2017 The consequences and risks of the reforms in Russian higher education (Moscow: Delo)
[10] Kagan A V 2010 New technologies and forms of education 17 31–35
[11] Sajfutdinova G B and Sabirova Ya O 2016 Bulletin of modern science 12-2 (24) 25–27
[12] Lavrinenko S V and Polikarpov P I 2017 The Science of Krasnoyarsk 6 (1-2) 335-349