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## MODERN PROBLEMS OF ENERGY

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The article deals with the problem of ensuring energy security, which is one of the most important national priorities. An attempt is made to outline the main ways to solve the domestic energy problem. The conclusion is formulated that the lack of modern energy in Kazakhstan should be called the reliance on rapidly inexhaustible sources of energy resources. The necessity of increasing the depth of domestic oil refining and the introduction of technologies for producing synthetic liquid fuels and petrochemical products from coal is justified. It is noted that the XXI century. It is unthinkable without nuclear energy, since the solution of many problems in the domestic economy is associated with the implementation of peaceful nuclear energy projects.

The current socio-economic situation of our country determines the extreme urgency of the state's purposeful activities in the field of energy security, which has a decisive place in the overall system of economic and national security of Kazakhstan. The domestic energy sector has a huge impact on the social situation in the country. And the level of energy comfort and the degree of availability of energy resources largely determine the quality of life of Kazakhstanis.

Energy security should not only help prevent conflicts over energy resources between suppliers and consumers, within a group of supplier countries and within a group of consumer countries, but also mean:

1) mutual responsibility of the consumer and the supplier of energy resources in compliance with the principle of mutual respect of the parties;

2) expanding access to energy resources;

3) diversification of energy supplies and sources;

4) depoliticization; fair competition; globality;

5) social orientation, while respecting all these principles, not only by one country, but also by the world community as a whole.

Currently, the world economic science offers a fairly large number of indicators of energy security. According to M. U. Spanov, Doctor of Economics, the following indicators of energy security can be determined for Kazakhstan:

- dynamics of the energy intensity of the economy;
- dynamics of production of the main types of energy carriers;
- degree of diversification of energy exports;
- availability of strategic energy reserves;
- state of transport systems;
- structure of energy consumption and reserves of the main types of fuel;
- socio-political situation in the areas of production and transportation of hydrocarbons;
- the level of accessibility of global transport communications. [1]

Ensuring the energy security of the country, therefore, is associated with the identification and systematization of a complex of threats, whose attack is directly or indirectly capable of damaging the country's energy sector. All threats to the fuel and energy complex (FEC) are conditionally divided into internal and external, the priority of which varies depending on the importance of the tasks facing the country.

To date, various state measures aimed at regulating the processes in the fuel and energy sector are usually divided into preventive and liquidation measures.

Preventive measures are aimed at creating an economy in the country that is less vulnerable to energy threats and is able to quickly adapt to changing conditions. Within the framework of the state energy policy, these measures should concern structural changes in the economy as a whole, restructuring the structure of the energy balance, stimulating the production of various types of energy resources, and proposals for the creation of energy-saving technologies. [1]

An important factor is the foreign policy support of the country's energy strategy. Creating a favorable foreign policy background is one of the cornerstones of the republic's export policy, since, given the geopolitical and geo-economic characteristics of Kazakhstan, interstate relations can become a stimulator or a limiter of economic growth.

Liquidation measures are usually associated with the creation of strategic reserves of energy resources, as well as with strict state control of their distribution in the event of gaps in the energy infrastructure.

Of course, it is simply impossible to solve all the problems of energy security in the shortest possible time. However, the tactical challenge today is to choose and adopt the highest priorities that could be achieved with the existing capabilities, resources and incentives, interests and financial capabilities of all parties.

The analysis of the current state and prospects of development of the energy industry of the Republic of Kazakhstan (ROK) allows the author to formulate the main ways to solve the Kazakh energy problem. [2]

Today, Kazakhstan has significant reserves of primary energy resources. Its subsoil is rich in coal, uranium and hydrocarbon raw materials. The territory is characterized by inexhaustible environmentally friendly and surface energy

resources: wind, solar, rivers and watercourses. According to their potential per capita, Kazakhstan occupies a leading place among the countries of the world.

The potential of the solar energy flow falling on the territory of Kazakhstan is about 1016 kWh per year. The hydroelectric potential of 2174 rivers of the republic is high. Theoretically, it is estimated at 163 billion kWh per year. The mountainous areas in the east and south-east of the republic are saturated with small rivers and watercourses suitable for the construction of small and micro hydroelectric power plants.

Only a few countries have such unique and diverse energy resources. Kazakhstan is one of the few countries that is able to provide itself with its own fuel and energy resources in the long term, while maintaining large export opportunities.

The oil and gas sector of the Republic of Kazakhstan remains the engine of the national economy, providing about 20 % of GDP growth. Currently, more than 260 thousand people are employed in this field.

Apparently, in the expected future, an important point of the new energy policy in Kazakhstan should be a decisive rejection of the export of " raw " energy carriers and a gradual transition to the export of processed energy carriers. The export of " raw " energy carriers in the form of natural gas and crude oil to the republic is objectively unprofitable and represents, in essence, the support of a foreign producer. Kazakhstan, by supplying gas and oil to foreign producers, provides them with fuel and raw materials for the production of organic synthesis products, plastics, chemical products and other products. As a result, Kazakhstan spends a significant part of its profits from energy exports on the purchase of industrial products produced using Kazakhstan's own gas and oil. The price difference between raw materials and finished products is such that, in any case, foreign multinational corporations remain in favor.

Meanwhile, research has revealed that in developed countries, every dollar in the petrochemical industry gives 2-3 dollars of growth to GDP, and every new job in the industry contributes to the creation of 7 new jobs in the economy. According to the forecasts of world experts, by 2030, the consumption of petrochemical products will grow from 1 to 2 trillion dollars, which indicates a significant potential of the market for petrochemical products. As for the implementation of oil and gas chemistry projects in our country, much in this regard has yet to be brought to a logical conclusion. [2]

So, in the future, Kazakhstan should export the products of energy-intensive industries, with a profit from the sale of products of higher processing. The first stage of solving this problem should be the displacement of imported organic synthesis products from the domestic market.

A promising point of the new energy policy in the republic is the gradual transition from rapidly exhausting to hardly exhausting energy sources. Betting on the extraction, use, and export of rapidly exhausting sources of energy — oil and gas-is extremely risky. Intensive oil and gas production requires constant renewal of reserves, which requires significant expenditures on geological exploration, and then large investments in the development of new fields in hard-to-reach and less

developed regions of the country in terms of infrastructure. The further away, the higher the cost of each ton of oil and cubic meter of gas. There is a possibility that the moment will come when maintaining oil and gas production in the established volumes will become almost impossible due to the complete exhaustion of the resources of the developed fields and the huge difficulties of developing new ones (for example, mineral reserves lying at great depth).

Therefore, in the long term, it is necessary to move from the use of rapidly exhausting energy sources to the use of much larger reserves of coal and other types of fuel, little-used fuel, as well as non-fuel resources, primarily waste (modern technologies for their processing allow you to get a wide range of energy carriers, starting from high-quality jet fuel, ending with flue gas).

The implementation of the principles outlined in the first two paragraphs will allow us to switch to a new model of using natural oil and gas. And it will be used not only for fuel needs and export supplies, but also as a valuable raw material for the domestic chemical industry, i.e. it is a certain model of waste-free production with benefits for the Kazakh economy in general.

It is known that the electric power industry occupies a special position in energy security. Here, the transition to the implementation of the project of an intelligent energy system with the involvement of all the components of this industry in a single base is important. This will ensure energy security and redundancy, increase the efficiency of the use of transit and export potential, including optimizing the structure of the energy sector, taking into account the available reserves of fuel and energy resources. As part of this work, it is necessary to reduce the number of energy transmission organizations, modernize electric networks and introduce automated commercial accounting systems at all levels, including systems for monitoring electricity quality indicators.

In the future, a significant point of the new energy policy in the country is the balance between autonomous and centralized energy. A new approach to the use of inexhaustible energy sources will solve another serious problem of modern energy of the Republic of Kazakhstan — the excessive concentration of heat and electricity generation at large power plants, and this will require huge investments for major repairs, reconstruction and development.

The way out of this situation is to expand the scope of application of autonomous sources of heat and electricity on local fuels and create a certain balance between large centralized and autonomous energy sources (for example, in the proportion of 70: 30). The expansion of the use of autonomous energy sources will also allow optimizing engineering networks: gas pipelines, power lines, heating mains and eliminating excessively long and extensive networks that require large investments for construction and major repairs.

Naturally, the picture of the energy industry will not be complete if we do not characterize the situation associated with another type of energy production — nuclear energy.

Kazakhstan accounts for about 25 % of the world's proven uranium reserves. The existing production facilities for the enrichment and processing of uranium in

the republic are a good base for the creation of nuclear energy. In addition, there is a sufficient staff of qualified engineers and scientists.

Now Kazakhstan is actively developing a peaceful atom. There are scientific nuclear reactors in the country, and a Bank of low - enriched uranium has been established on the basis of the Ulba Metallurgical Plant under the auspices of the IAEA, which will provide this material to other countries. Low-enriched uranium is a safer, more economical fuel for the VVR-K research nuclear reactor, but most importantly, it cannot be used to create nuclear weapons.

In addition, the possibility of building a nuclear power plant in Kurchatov is being discussed.

Today, humanity is on the verge of another technological revolution, when there will be a rapid increase in electricity consumption. Therefore, another aspect of the new energy policy of the Republic of Kazakhstan during the current century is the development of nuclear energy as an alternative option, ensuring the peaceful achievements of nuclear science that are beneficial for humanity, and further expanding the research and applied work carried out by Kazakhstan's nuclear physicists.

It is known that the mineral resource base of the coal industry in our country is quite strong. Despite the large volumes of coal production, their reserves in the subsurface remain significant. As of 2015 Kazakhstan ranks eighth in the world in terms of proven coal reserves, with balance reserves of 33.6 billion tons. [1]

Over the 25 years of independence, Kazakhstan's coal mining enterprises have produced about 2.3 billion tons of coal. Most of all, it was produced in Bogatyr Komir LLP-about 1.3 billion tons, in the Vostochny section-about 500 million tons, about 300 million tons. - production of "ArcelorMittal Temirtau" and about 200 million tons were produced by the miners of "Shubarkol Komir". During this time, more than 600 million tons of coal were exported to the near and far abroad. Today, coal is considered not only as a fuel for power plants for generating electricity and heat, but also as a raw material for coal chemical production, allowing it to be converted into products with high added value.

During the state visit of the President of the Republic of Kazakhstan to the People's Republic of China in May 2014, at a meeting with the Chairman of the Board of the China Tsinghua Energy Corporation, a leading company in the field of industrial development of deep coal processing technologies, the issue of implementing joint projects in the field of integrated coal processing was considered. [3]

Currently, within the framework of these agreements, work is underway to implement a project for deep processing of coal to produce synthetic liquid fuels. The project participants are JSC "KazMunayGas — processing and marketing", LLP "JV Arbat", LLP "Razrez" Kuznetsky " and the Chinese Energy Corporation "Tsinghua". The created joint venture works in the field of market research.

Hence, in the future, the core point of the new energy policy in Kazakhstan is to intensify efforts to support the preservation of the level of coal production in the country by expanding deep integrated processing (primarily through the

diversification of export supplies, through the production of diesel fuel and other liquid synthetic products from coal), as well as the extraction of methane from coal seams for gas supply to the Karaganda region and the development of related projects — gas processing, construction of gas power plants, conversion of public transport to gas.

Today, in Kazakhstan, man-made pollution of the natural environment is great, causing irreparable damage to nature and adversely affecting human health. The largest source of pollution is thermal power plants (TPPs).

Currently, coal-fired power generation in Kazakhstan accounts for more than 70 %, i.e. the vast majority of the electricity generated is produced at power plants that burn coal in furnaces. Moreover, mainly low-calorie brown coal with a high ash content (up to 50% or more) is used, in most cases it does not meet the fuel standards for boiler equipment, which further increases the technological waste. During the combustion of fossil fuels, toxic substances (nitrogen oxides, sulfur, carbon, and toxic hydrocarbons), ash, heavy metal particles, and dust are released into the environment. Gorenje process is accompanied by the consumption of huge masses of oxygen. Along with the multiple excess of the maximum permissible concentration of toxic substances, carbon dioxide (CO<sub>2</sub>) released during gorenje (so-called greenhouse gas), entering the atmosphere, creates in it a retarding infrared radiation and contributes to the heating of the Earth's surface and the lower layers of the atmosphere effect. [3]

Every year, Kazakhstan's thermal power plants emit up to 100 million tons of CO<sub>2</sub>, which contributes to global climate warming with all the resulting negative consequences for all life on the planet.

Another negative factor of coal-fired thermal power plants is the huge ash dumps with an area of hundreds of hectares, which are an additional and permanent source of pollution. The radiation level of ash dumps is 10-20 times higher than the level of radioactivity generated by nuclear power plants.

Today, the issues of reducing the harmful impact on the environment are extremely relevant both for the industry and the economy as a whole. [3]

In addition, you need to understand that large-scale projects in the energy sector require large investments. And the raw materials reserves are not unlimited, i.e. the reserves of oil, gas and coal in Kazakhstan are not infinite. Hence, it is important to develop a concept of understanding in the energy, economy and ecology as a single mechanism for the effective operation of any production, which would meet the interests of our country and would not allow uncontrolled waste of raw materials.

Thus, in the future, in the energy policy of the republic, priority should be given to alternative energy sources. In particular, it is possible to avoid the harmful environmental impact of thermal power plants by reducing the amount of organic fuel burned by replacing coal-fired thermal power plants with alternative sources with environmentally friendly electricity production technologies. Modern science and practice have worked out a number of real directions.

In conclusion, I would like to emphasize that energy security is among the highest priorities of the state. And in my opinion, our country has all the potential

and "scientific minds" to solve all the above problems , as well as to develop the main tasks of the Kazakh energy sector for the coming years and the foreseeable future.

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