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## **Unlocking Energy Sector Reforms: Tackling Monopolies and Regulatory Challenges**

### *Mengatasi Monopoli Alami dan Tantangan Regulasi: Membuka Potensi Reformasi Sektor Energi*

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#### **Abstract**

This article presents a comprehensive examination of recent energy sector reforms, their outcomes, persistent issues related to natural monopolies, regulatory and managerial challenges, and provides suggestions for addressing them. The study aims to analyze the effects of energy sector reforms, identify existing issues, and propose solutions to mitigate them. Using qualitative analysis of literature and data from diverse sources, the study reveals that reforms have fostered increased competition and investment, yet the presence of natural monopolies continues to impede the electricity market's functioning. Regulatory and management challenges, including inadequate frameworks, lack of transparency, and ineffective supervision, are also identified. The implications of this research highlight the need for policymakers to prioritize promoting competition and market-driven mechanisms, implementing effective regulations, and enhancing transparency and accountability in the management of the energy sector. These findings offer valuable insights to researchers, policymakers, and stakeholders globally, facilitating the design and implementation of more effective energy reforms for sustainable development.

#### **Highlights:**

- Energy sector reforms: This study examines the effects of recent energy sector reforms, analyzing their impact on competition and investment in the industry.
- Natural monopolies: Despite reforms, the presence of natural monopolies continues to hinder the functioning of the electricity market, limiting competition and efficiency.
- Regulatory challenges: Inadequate regulatory frameworks, lack of transparency, and ineffective supervision pose significant obstacles to the successful implementation of energy sector reforms.

**Keywords:** energy sector reforms, natural monopolies, regulatory challenges, competition, transparency.

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## Introduction

Uzbekistan is among the countries that fully provide its needs at the expense of its energy resources. A significant contribution of the power generation capacity in the United energy system of Central Asia belongs to the Republic. The specificity of the technological process of production, transmission, distribution and consumption of electricity requires the maintenance of centralized management, which embodies the Joint-Stock Companies "thermal power plants", "Uzbekistan national power networks" and "regional power networks". With the supply of electricity to enterprises under JSC "thermal power plants", with the supply of electricity to enterprises under JSC "regional power networks" through main power networks with a voltage of 220-500 kV with a total length of more than 9.7 thousand kilometers, JSC "National Power Networks of Uzbekistan" is carried out.

The sale of electricity to its final consumers in the Republic is carried out by enterprises of fourteen Distributive and reselling regional electricity networks under the jurisdiction of JSC "territorial electricity networks", which act as a shareholder society in each territorial structure. On the balance sheet of enterprises, there are more than 250.4 thousand kilometers of electrical networks and 1,700 substations with a total length of up to 110 kV. The supply of electricity to Republican consumers has mainly the most efficient voltage 0,4-6-10 kV is carried out through electrical networks with a length of more than 223.8 thousand kilometers. Joint-stock companies "thermal power plants", "Uzbekistan national power networks" and "regional power networks" are the only production complex engaged in the design, construction and installation and adjustment work and the repair and operation of basic and auxiliary equipment of power plants and networks.

The presence of a developed production base and highly qualified personnel allows a high level of use of electrical farm facilities. In accordance with the decision of the president of the Republic of Uzbekistan on the strategy for the further development and reform of the electric power sector in the Republic of Uzbekistan, according to the program for the development of production capacity in the period up to 2030, the total cost of increasing production capacity with the construction of new energy blocks with a total capacity of 27 It is envisaged to carry out large investment projects equal to the US dollar. At the same time, energy blocks with a mean and physically outdated total capacity of 6.4 GW in thermal power plants are removed from Operation.

The implementation of measures in the thermal energy network provides for the introduction of modern energy production technologies based on high-performance steam-gas turbine stations, the efficiency of which is 60%. Special attention is paid to the construction of the first nuclear power plant in the Republic with a capacity of 2.4 GW. In the process of transition to a "green" economy, the creation of modern, solar and wind power plants with a total capacity of 6.7 GW is a priority for the development of electricity.

The restoration of the electric power industry etkazib Berish as a total recovery amounted to 2.4 billion. Mr. dollariga TEN bulgan 2.7 ming km uzunlikdag 220-500 sq. kkkkkm 9 tg. Shu bilan birgalikda, the total growth was 9.9 billion. Mr. dollariga TEN bulgan 39.6 ming ta transformer substation and 140.9 ming km uzunlikdagi 0,4-10-35-110 in this regard, it is necessary to carry out repair and repair reconstruction, as well as to eliminate malfunctions. Natural, electric energy construction requires investments, only the existing state energy sector can be considered a funded enterprise of oshirish.

The construction of power plants with a total capacity of 15 GW will cost 17.3 billion. Planned at the expense of direct investment equal to the US dollar. All stations will be built at the expense of direct investment, with the exception of hydroelectric power plants, nuclear power plants and several regulatory power stations. For example: the construction of a new power plant in the Syrdarya region on the basis of a steam-gas device in two stages, each with a capacity of 1300 MW; Construction of a new power plant based on a steam-gas device with a total capacity of 850 MW in Tashkent region by the Turkish company Cengiz Energiya; construction of a new power plant based on a steam-gas device with a total capacity of 900 MW in Surkhandarya region by the Turkish company Yildirim Energiya; expansion of Navoi ies with the construction of a.

In the future, the most optimal way is to sell part of the shares of these power plants to private investors and create joint ventures based on the DXSH principle. The step-by-step reform model of the electric power sector guarantees an ever-increasing surplus to electricity in the economy and population, without a sharp increase in tariffs. To this end, the conduct of scientific research work in this direction always retains its relevance.

## Analysis of thematic literature

The electricity sector is one of the leading, base sectors of our economy. After all, the provision of sustainable economic growth rates, the increase in labor productivity, the well-being of the population and the rise in the standard of living are in many ways inextricably linked with the prospect of this sector. Uzbekistan's rich energy potential as well as efficient public administration make it possible to use existing water and energy resources and hydrocarbon raw materials wisely, to fully ensure the demand for electricity. In this case, thermal energy remains the main source of electricity production in our country, and its development using energy-efficient technologies ensures the stability of the entire country's energy system.



The group of countries for the production of electricity in the world is located as follows: South America, Western Europe, Asia, CIS countries, Latin America, Africa, Australia. In developed economies, 80% of the total electricity is produced, while developing countries account for 20%. [1]

The electric energy sector forms the main sector of the economy, providing the national economy with the universal and immutable resources necessary for any production process. The objective barrier to the development of competition in the field of transmission and distribution of electricity, as in any infrastructure sector, is considered to be the technological features of production. [2]

Companies operating in the field of electricity-ka of developed countries are constantly improving their traditional other-ruv mechanisms, in order to have their own consumers in the electricity market. In particular, long-term strategies for the development of the industry are being developed, incentive me-khanisms for the implementation of prepayment for electricity are being introduced, capital investments in the field are being developed, programs based on ideas based on research and innovation in customer service are being developed. [3]

Existing problems in the energy sector can accumulate, questioning the development of the industry and sectors and their financial situation. To prevent this, it will be necessary to focus on the development of the electricity sector in a decent way (expanding the use of renewable sources, effective use of low-cost technologies, prepayment of fees for used electricity, the formation of a competitive environment by increasing the involvement of foreign capital amounts in the industry). [4]

N. on the reforms carried out in the electric energy sectors of our republic. Yusupova [5], L.A. Sokolova [6], A.G. Scientists such as Nuriddinova [7] conducted scientific research. Most of their scientific research work is aimed at eliminating problems and shortcomings in the field of electricity.

Economic support for the energy sector has always been carried out by the state, and it has always been within the spheres of natural monopolies. For this reason, the electricity price (tariff) generated at all times has been set by the state.

The electricity market of any country has historically been under state control, and the regulation and management of network activities has been governed not by market mechanisms but by public administration mechanisms. Over-centralization of the process of electricity generation and supply to consumers will keep the network in a monopoly position. As a result, it hinders the use of more flexible and diverse forms of electricity generation and sales management, as well as various forms of barriers to market liberalization and the effective formation of a competitive environment. [8]

In the world's experience, the need for widespread use of alternative and renewable energy sources is determined by the rapid growth of the demand for electricity, which will increase by 1.5 times by 2030 compared to 2010, that is, by 2050, it will increase by 3 times. [9]

The main problem facing the oil and gas industry today is the importance of using low-cost methods in the production and delivery of finished products to consumers. For this, effective management of the supply chain in the field is to increase the efficiency and competitiveness of oil and gas enterprises and its supply in general. [10]

While ensuring energy security is not easy, it is important to take steps to achieve it. Energy

security is a multifaceted concept that has dimensions of particular importance: technical and physical obsolescence resulting from infrastructure breakdowns, natural disasters, social unrest, political actions, or acts of terrorism; long-term physical availability of energy supply to meet future growing demand; harmful effects on economic activity and the population due to energy shortages, prices or price changes; serious consequences affecting human health, damage from terrorist acts that damage various forms of property. [11]

As the population of the earth is increasing, their needs are also increasing accordingly. Science and technology are being developed by world scientists in order to effectively meet human needs. As a result of the development of science and technology, the economy of the countries of the world is developing. For the effective development of the country's economy, regular and high-quality electricity supply is necessary. No country's economy can develop without electricity. Electricity generation and supply to consumers are separated by their own characteristics. At the same time, the production of electricity requires a large amount of non-renewable energy sources (natural gas, coal, oil products, etc.). This causes the cost of electricity production to increase. Renewable energy sources, namely the "green four" energy (solar, wind, hydro, and nuclear energy) are needed for low-cost electricity generation. [12]

Currently, about 85% of the existing electricity production capacity of our country corresponds to the share of thermal power plants (ies) and thermal power centers (IEM). In this process, the Joint-Stock Company "thermal power plants" carries out the task of generating electricity, ensuring that electricity and Heat are generated in the specified volumes in order to ensure the satisfaction of the needs of the economy and population of our country.

The Joint-Stock Company" thermal power plants "was established in accordance with the decision of the president of the Republic of Uzbekistan dated March 27, 2019 PQ-4249"on the strategy for further development and reform



of the electric power sector in the Republic of Uzbekistan". Currently, the society has 12 businesses, of which 6 are thermal power plants (IES), 3 are thermal power centers (IEM) and 3 are service contractor organizations.

2019 of the Cabinet of Ministers of the Republic of Uzbekistan

According to the decision of December 14, 1988 "on measures to improve the efficiency of management of enterprises of the coal industry", the stock packages of the Joint-Stock Companies "Angren IES" and "New-Angren IES" were given to the state asset management agency of the Republic of Uzbekistan in accordance with the established procedure, these coal hot power plants were given to the trust management of LLC "Central Asia Energy".

The installed capacity of thermal power plants (IES) and thermal power centers (ies) within the community is 11,699 MW, and the current capacity is 10,823 MW. The main fuel for generating electricity and thermal energy is natural gas and reserve fuel is mazut.

## Method

The article makes extensive use of methods of scientific study, comparative comparison, study and economic comparison and analysis of existing problems in the management of the electric power sector in our country, logical thinking, scientific abstraction, analysis and synthesis, induction and deduction.

## Result and Discussion

Currently, the total production capacity available in our country in terms of electricity production is 16 gvt, of which the share of the total capacity of thermal power plants (ies) and thermal power centers (IEM) within the society is 11.69 Gvt or 73 percent.

As a result of the modernization of existing capacities and the launch of modern new energy-efficient steam-gas devices, in 2021, the capacity of newly launched energy-efficient equipment was increased to 6,309 MW, which accounted for 53.9% of installed capacity.

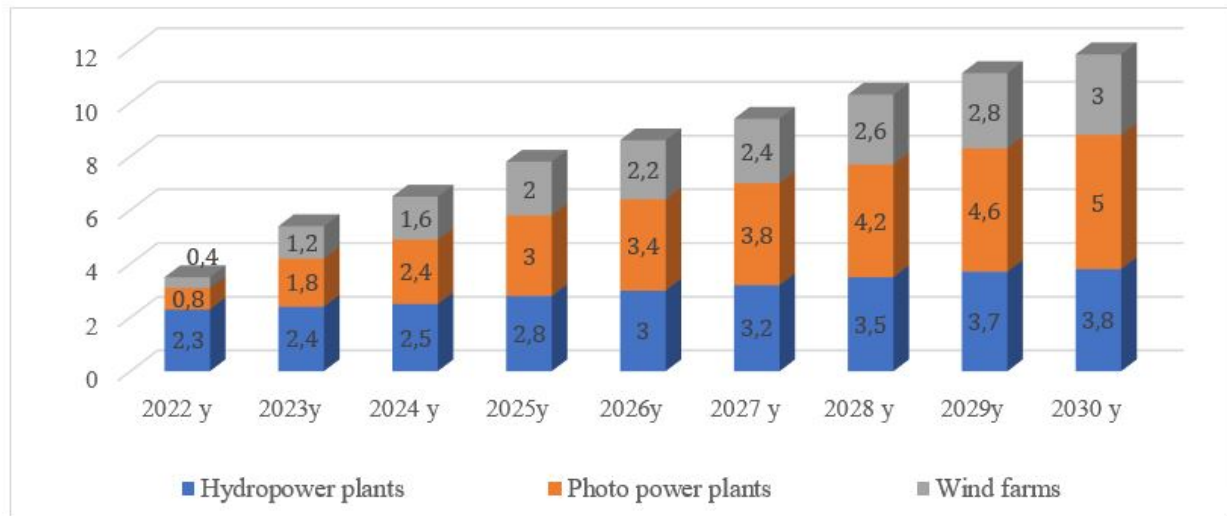
In the field of electricity production in the Republic of Uzbekistan, a forecast of how much power will be produced in which regions using renewable energy (QTEMS) in the period up to 2030 is given. How much gas can be saved per year when using renewable energy sources is shown in Table 1.

Types of QTE	Proposed provinces of implementation	Plan resurrected power, MVt	Planned production (core.kW.clock)	In saved gas, billion
Sun	Republic of Karakalpakstan, Navoi	2000	5	1,517
Wind	Republic of Karakalpakstan, Navoi	40	0,08	0,024
Hydro	Tashkent, Surkhandarya, Namangan and Fergana	938	2,60	0,788
Obtaining biogas from animal and poultry waste	All	450	3,60	1,092
Biogas from wastewater treatment facilities	in the regions	15	0,12	0,0036
Total	3443	11,40	3,457	

**Table 1.** Assessment of the possibilities for the introduction of renewable energy (QTEMS) to generate electricity until 2030[13]

Table 1 aims to effectively use renewable energy sources such as solar power, wind power, hydroelectric power stations in electricity generation for the period up to 2030. As a practical result of this, the president of the Republic of Uzbekistan in his speech on the 30th anniversary of the independence of the Republic of Uzbekistan noted that "the solar power plant, which was launched yesterday in the Karmana District of Navoi region at the expense of an investment of US \$ 110 million, was the first huge step in the energy system of Uzbekistan."

Our country's Angren, Boysun and Shargun mines have reserves of up to 4.4 billion tons of coal. Coal mining is about 3 million tons per year. We can see the forecast indicators of energy production based on renewable energy sources by 2030 in Figure 1.



**Figure 1.** Energy production forecast based on renewable energy sources by 2030, MW [14]

From the data presented in Figure 1, it can be seen that in 2022, electricity production using renewable energy sources is projected by hydroelectric power plants to be 2.3 MW, photo power plants - 0.8 MW, wind power plants - 0.4 MW, by 2030, electricity production using renewable energy sources is projected to be 3.8 MW, photo power stations - 5 MW, wind power stations - 3 MW.

The main goals, objectives and priorities of the strategy are: to meet the electricity needs of consumers of our country, in a state independent of the import of energy sources, at the expense of domestic electricity production capacities; to ensure energy security; to increase efficiency in the production of electricity in order to meet the increasing demand; to prevent the obsolescence of electrical equipment due to.

To effectively complete the above tasks, it is necessary to ensure the implementation of the following main priorities:

first, to improve the power accounting system and dispatch management by building new energy facilities and modernizing existing ones, introducing modern information and communication technologies for the effective functioning of the domestic market;

secondly, to improve the efficiency of the use of electricity at all stages of the technological process on the basis of energy-efficient technologies, as well as optimize production capacities;

third, the creation of mechanisms for the implementation of investment projects based on the principles of Public-Private Partnership;

fourth, the formation of a favorable legal framework and an administrative investment environment and a wholesale market for electricity in the long term, first of all, to attract foreign direct investment;

fifth, improving corporate governance and increasing the transparency of financial and economic activities of state-owned enterprises in the electric power sector.

Currently, it is planned to gradually increase the power generation capacity in 2022-2026 by modernizing and reconstructing existing power plants, building new production capacities based on energy production technologies with high efficiency, taking into account the growing demand for electricity in our country.

Under the investment program, up to 2026, 4 investiture projects will be implemented by the society, and as a result, an additional increase in available capacity will be achieved by 2,264 MW.

1. Investment project" expansion of Talimarjon ies with the construction of two next steam-gas turbines with a total capacity of no less than 900 MW " (will be launched in 2024-2025).
2. Investment project" construction of 2 gas turbine units with a capacity of 32 MW in Tashkent IEM " (will be launched in 2023).

3. Investment project" construction of a third steam-gas device with a capacity of 650 MW in the Navoi IES Joint-Stock Company" (will be launched in 2024).
4. Investment project" construction of a fourth steam-gas device with a capacity of 650 MW at the Navoi IES Joint-Stock Company" (will be launched in 2025).

The installed capacity of thermal power plants (IES) and thermal power centers (IEM) will reach 14.0 gvt due to the launch of new energy-efficient devices by 2026, and the specific fuel consumption for electricity generation is 323.7 gr/kW in 2020.259.4 gr/kWh.the reduction to the clock is achieved.

In view of the significant technical potential of existing conventional power plants, it is also planned to carry out modernization and Technical re-equipment work using modern technologies to ensure the cost-effective operation of thermal power plants (IES) and thermal power centers (IEM). This makes it possible to make the most of the technical resources of existing energoblocks and improves their technical and economic performance, and also makes it possible to use their generation capacity in the adjustment mode when covering the highest loads of the energo system.

To this end, in the near future, in the modernization of thermal elecrt stations "Tashkent IES" (energoblocks 7 and 8), "Taxiatosh IES" (energoblocks 7 and 8), "Navoi IES" (energoblocks 11 and 12), it is planned to achieve additional adjusting capacities by installing gas turbines on existing steam turbines (repairing).

Taking into account the sharp decrease in the demand of large thermal energy consumers for thermal energy in Fergana IEM, where the production of electrical energy depends on heat consumption, the existing PT-60-90/13 steam processor from a counter-pressure turbine instead of a new 50 MW K-50-1.3 steam turbine installed 1.1 bn per year. kW.clock power generation is achieved.

The Mubarak IEM also has an additional annual revenue of 3.6 billion by building a 450 MW steam-gas facility in this IEM due to falling demand for thermal energy. kW.organizational measures are being carried out to achieve clock power generation.

Due to the commissioning of new production facilities on the energy system, the construction of new hydroelectric power plants, the establishment of electricity production on the basis of renewable electricity sources, that is, wind and solar power plants, physically outdated energy projects of thermal power plants (IES) and thermal power centers (IEM) are phased out of use. As a result, by 2026, the volume of electricity production by the Joint - Stock Company" thermal power plants " is 62.0 billion. kW. by the hour, the absolute energosamarador in production is fully transferred to the share of equipment.

During 2022-2026, a rapid planning and management system will be created, which will meet modern requirements and international standards for improving technical and economic indicators, in-depth diagnostics and identification of systemic shortcomings for the development of information and communication technologies, namely:

1. 1 kW.s. analog-to-digital modifiers and applications will be installed to ensure online control of the specific consumption of fuel for electricity generation, as well as the rational and efficient use of fuel;
2. step-by-step transition to digitization of planning and preparation processes for repair work - acceptance of applications, determination of the volume of work, purchase of material and technical resources, identification of the contractor and carrying out repair work, including control;
3. the establishment of a single repair and Service Service Enterprise on the basis of the enterprises of OJSC "self-improvement", OJSC "Uzbekenergota'mir" and JSC "Özenergota'minash" within the society and granting it the status of a provider of Integrated Service services to energouskunas;
4. Organization of the Center for monitoring generation on the basis of the Joint-Stock Company" thermal power plants " in order to maintain control over production indicators in Real time;
5. implementation of large-scale transformational processes in society, including the introduction of a modern management system, the implementation of a corporate information ERP system aimed at monitoring and managing financial and economic and organizational processes, the introduction of International Financial Reporting Standards (IFRS);
6. implementation of the measures established in the roadmap developed by the international consultancy McKinsey Company to improve the efficiency of operational activities.

One of the important conditions for the development of modern Uzbekistan is the economic stability of the country, which is largely associated with achieving energy security.

The Uzbekistan energy network carries out state regulation of the processes of electricity and thermal energy, coal production, transmission, distribution and consumption, as well as the extraction of Oil, Gas, their processing, transportation, distribution, sale and use. A number of, tasks are set before the Energy Sector:

1. Coordination of the energy sector; conclusion of agreements on the distribution of products and control their implementation; attraction of private capital to the processes of extraction and production of energy sources; development of the Dchshni (public-private partnership) system in the production of electricity;

- improvement of tariff policy in order to form a competitive business environment, increase and diversify the production of energy sources;
2. introduction of modern corporate governance in the energy sector, including taking into account the proposal of the World Bank, which provides for the optimization of production processes.

Today, the following works are carried out in order to develop the energy sector:

In 2020-2030, the development of the Uzbekistan fuel and energy supply strategy and in 2019-2021 the program for digitization of the electric energy complex began, which provides for the processes of automation of enterprise resource planning (ERP) and dispatch control and data collection (SCADA).

One of the main priority issues of the development of the electric power sector in Uzbekistan is the development of production facilities in such areas as thermal power plants (ies), nuclear power, renewable energy sources (QTEM), attracting foreign direct investment.

Another important project in the country is the implementation of the automated system of accounting and control of electricity (ASKUE) and the automated system of accounting and control of natural gas.

In accordance with the recently adopted law, work is being carried out on the implementation of a number of investment projects under the terms of Public-Private Partnership (DSC).

In the energy sector, it also carries out measures aimed at constantly stimulating energy saving, introducing appropriate technologies and increasing the awareness of the population about the importance of energy saving.

According to experts from "özenergoinspektsiya", today in every house there is an opportunity to save an average of 400 kWh of electricity per year. If each family saves 400 kW of electricity, then the amount of electricity saved under the Republic is 1.8 billion. kWh. Electricity saved in this way will reach, for example, the Jizzakh or Syrdarya regions with electricity throughout the year.

## Conclusion

The energy sector's plans for the pre-2030 period include the following. In the field of electricity, the production capacity of the Republic currently exceeds 14.1 thousand MW. The bulk or 85.8% of these generating capacity corresponds to the contribution of thermal power plants. By 2030, the total power output in maximum consumption hours increased from 11,000 MW in the fall-winter period 2018-2019 to 20,000 MW. In this way, by 2030, the country will have to increase its energy capacity by almost 1.8 times.

In accordance with the program for the implementation of large investment projects for 2019 - 2030, new and modernized production facilities with a capacity of 15.6 GW will be put into operation in 2030 at one thermal power plant. At the same time, it is estimated that physically outdated production power and equipment with a capacity of 6.4 GW at thermal power plants will be decommissioned. In this way, by 2030, their installed capacity will reach 78.9 thousand MW (that is, it will increase to 6.8 thousand MW).

Today, in order to increase the production capacity of the energy system in the period up to 2030, the Ministry of energy is working on large investment projects. Including the construction of modern energy units with a total capacity of about 10 GW (Syrdarya, Navoi, Tolimarjan, Taxiatosh, Torakurgan thermal power plants, etc.). Build AES with a total capacity of 1.9 GW and an AES of 2.4 GW. Construction of power plants that use renewable energy sources, bringing the total share of solar and wind power plants to 21%. Construction of maneuverable production capacity on the basis of gas-turbine devices or aviation gas turbines with a total capacity of about 3 GVt. All these efforts will serve to ensure the energy security and rapid development of Uzbekistan.

- Development and implementation of a unified state policy in the fuel and energy sector aimed at ensuring the energy security of the Republic of Uzbekistan, sustainable provision of economic sectors and the population of the country with fuel and energy resources, extensive promotion and development of renewable energy sources;
- implementation of state regulation of production, processing, transportation, distribution, sale and use of electricity and thermal energy, coal production, supply, distribution and consumption, as well as products derived from oil, gas and their processing;
- implementation of unified regulatory and technical regulation in the energy sector of the Republic;
- to create a balanced system of strategic planning and development of the fuel and energy complex and to increase and diversify the production of energy resources, develop short, medium and long-term inextricably linked forecasts of the production, supply and consumption of all types of energy resources, as well as targeted programs for the complex development of the energy sector;
- increase the investment attractiveness of the fuel and energy sector due to the development of Public-Private

Partnership, improving tariff policies that promote favorable competition in the energy resource market and the formation of a business environment;

- coordination of the implementation of investment projects in the fuel and energy sector, active involvement of private capital in energy resource extraction and production processes, establishment of cooperation with international financial institutions, donor countries, companies, banks and other structures;

-assistance to the energy network in the implementation of modern methods of corporate governance, advanced information and communication technologies and automated systems of management, accounting and control, on the basis of which to increase the efficiency of Management in the energy sector and reduce production costs, ensure the transparency of financial and economic activities of energy network organizations;

- to promote the introduction of innovative technologies in the production processes of organizations of the oil and gas and electric energy sector, to save energy resources and increase the level of energy efficiency;

-Organization of systematic work on training, professional development and retraining of engineering and technical and management personnel in the energy sector.

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