

# Increasing Management Efficiency in The Electricity Sector of Uzbekistan

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## ABSTRACT

This article shows how to actively organize modern management mechanisms based on advanced foreign experience, modern innovative ideas, developments and technologies in the effective management of the electricity sector, create a competitive environment, organize management methods based on market principles.

## CCS CONCEPTS

• electricity; • natural gas; • coal; • oil products; • power plants; • wind energy; • solar energy; • management mechanism; • management methods; • market principles.;

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## 1 INTRODUCTION

The electricity sector of Uzbekistan is one of the main components of the country's economy. The electricity sector has a direct impact on the development of other sectors. The reason is that for all industries and sectors today, no goal can be achieved without uninterrupted and quality power supply. The electricity network differs from other networks in its specific features. That is, according to its technological characteristics - it is impossible to store electricity in one place, according to its economic characteristics - the system of production and sale of electricity does not fully comply with market principles. In general, the process of production, transmission and distribution of electricity is a natural monopoly.

According to the Law of the Republic of Uzbekistan "On Natural Monopolies", the activities of natural monopolies are regulated by the state in the following areas [1]: transportation of oil, oil products and gas by pipeline; production and transportation of electricity and heat.

The energy market of Uzbekistan, as in many countries, is the largest network of natural monopolies (pipeline transportation of oil, oil products and gas; production and transportation of electricity and heat). Production processes in the energy sector are characterized by strong negative externalities, which are reflected

in the environmental damage caused by fuel and energy companies. All this determines the need for government control of the fuel and energy sector.

Improving efficiency through the modernization of existing technologies in the electricity generation network, attracting local and foreign investment in the network, the introduction of modern management mechanisms in the production, transmission and distribution of electricity is one of the current issues.

The introductory part of this article highlights the existing problems in the electricity sector, which should differ from other industries in terms of technological characteristics, and should be considered as a key raw material for the development of manufacturing and services.

The analysis of the relevant literature examines and theoretically analyzes the current problems in the field of electricity, the characteristics of the management of power generation, transmission, ways to use foreign experience in creating a competitive environment in these processes. Scientific analysis of the literature provides an opportunity to develop measures to improve management efficiency in this area.

The analysis and results of the article analyze the total demand for electricity in the Republic of Uzbekistan and the volume of electricity produced, the average capacity of the industry, the use of raw materials in electricity generation and measures to meet future demand for electricity.

The research methodology section shows how the indicators affecting management efficiency in the power grid are analyzed and the methods used in the research.

The concluding part of the article presents the ways to overcome the existing problems and shortcomings in the electricity sector and the recommendations that need to be implemented to improve management efficiency.

## 2 ANALYSIS OF THE RELEVANT LITERATURE

Today, a number of experts and economists have described the existing problems in the electricity sector and their solutions, as well as the introduction of management mechanisms based on new ideas in the industry in their research work.

The electric power industry is the basis on which gross domestic product (GDP) is created in all industries of the national economy. Traditionally, two indicators of energy intensity, which are calculated by the ratio of the amount of energy produced (consumed) and the GDP, are used for energy efficiency analysis. The level of energy intensity is influenced by many factors, including: the processes of industrialization and deindustrialization, introduction of energy innovations, energy carrier prices, the phase of the business cycle, economic growth, or recession [2].

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This results in high prices of energy and utilities, the increase in the number of emergencies in energy networks, nonproductive energy losses, rising greenhouse gas emissions. The lack of sufficient investments to the renewal of energy infrastructure and energy production technologies causes a gradual steady increase in the cost price of energy and energy services without improving the quality and reliability of energy supply [3].

In the current conditions, the role of the electric power industry in ensuring sustainable development is growing, as the achievement of energy efficiency becomes a global criterion for the functioning of economic systems at different hierarchical levels [4].

In most countries of the world, the main consumers of electricity in industry are small and medium-sized enterprises, the share of which is about 95%, and the main tool for researching their energy policy is an energy audit [5].

Due to the liberalization of the electricity market and competition between generating companies, calculating the dispersal of losses of the distribution network is a difficult task [6, 7].

In the electrical power market, price regulation limits the possibility of financing investment activities [8].

Non-utilization of the existing opportunities and potential of the electricity industry of Uzbekistan, in particular, renewable energy sources, including solar energy, belongs to the mechanisms of public-private partnership (PPP), the purpose of which is to expand financial support for investment [9].

As a result of maintaining the mechanism of state support for the development of the electricity system, the volume of investments is steadily declining. Accelerated obsolescence of power equipment continues [10].

One of the problems in the power grid is to reduce the impact of energy capacity on increasing production costs. High energy costs in industry are often determined by the obsolescence of production assets, equipment failure, technology imperfections [11].

Electricity supply systems cannot be understood as identical "dots", reacting in the same way upon specific regulatory measures. Electricity supply systems (ESS) are different from country to country and period to period and therefore also react differently upon specific regulatory measures. This is especially the case in a change from fossil fuel based to renewable energy based systems, as we will see in the following. In relation to this, it is important to analyze this difference as a function of different cost and value added structures in both the old fossil fuel system, the systems in transition to renewable energy, and the phase with 100% renewable energy [12].

A decentralization scenario, also often called the smart energy system road, where the different energy sectors, heat, electricity, transportation and biomass are integrated in such a way that for instance excess wind power is supplying heat pumps and heat storages in district heating systems. Eventually, this will lead to a development where wind power is used to produce fuels [13]. Several studies indicate that this leads to future technical and economically sustainable solutions.

Electricity is one of humankind's most significant scientific discoveries and is now integral to our daily lives. In addition, the development of electricity is an essential milestone in scientific progress, and ongoing research aims to identify new electrical energy sources or improve the existing methods of generating electricity [14, 15]. The crucial role of electricity and the necessity to

be environmentally friendly have encouraged investments in the use of green resources and waste energy for generating electricity [16, 17]. These ambient energy sources are considered to be accessible sources of energy, and are classified into two categories: natural energy and energy recovery resources.

Today, one of the main criteria of strategic management in its components to increase the efficiency of management in the electricity sector of the country is the assessment, forecasting and planning of electricity demand.

Clear definition of the theoretical and methodological basis of the problems in the electricity sector is an important factor in reforming the country's economy.

### 3 RESEARCH METHODOLOGY

The methods of studying existing scientific research on management efficiency in the electricity sector, comparative comparison of tariff and price formation, study of statistical data and economic comparison and analysis, logical thinking, scientific abstraction, data grouping, are widely used.

### 4 ANALYSIS AND RESULTS

Electricity generation is the burning of certain types of energy (coal, fuel, gas), the conversion of nuclear energy and kinetic energy (water, etc.) into electrical energy. Electricity generation is capital-intensive production with high non-refundable costs. Different types of manufacturing enterprises are characterized by different ratios of fixed (primarily capacity itself) and variable (mainly fuel) costs.

The process of electricity generation is divided into technologically separate vertical integrated stages - production, transmission, distribution and delivery (sale) of electricity. The implementation of these steps and the coordination of the operation of the industry as a whole will be ensured by a single centralized operational dispatch control system (DCS) of the country's electricity system. Generation and supply (sale) of electricity is a potential competitive activity. The management of electricity and heat transmission, as well as operational transmission, is part of the natural monopolies in the electricity industry and is therefore regulated by the state.

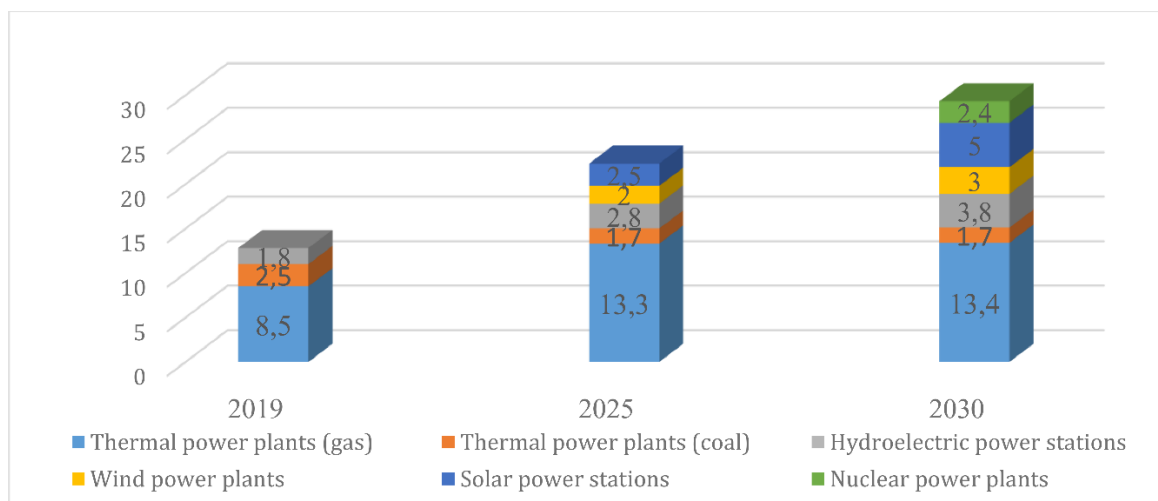
We can see in Table 1 how much the primary fuel and energy resources per capita corresponded to in 2000-2019. According to the table, the per capita primary fuel and energy resources, including oil and gas capacity, were 0.3 tons of energy in 2000 and 0.1 tons in 2019. Natural gas was 1.9 tons of energy in 2000, and by 2019 it will be 1.5 tons. Coal was 0.03 tons of energy in 2000, but did not change until 2019, and 0.03 tons of energy consumption. Hydroelectric power plants doubled from 0.01 tons in 2000 to 0.01 tons in 2019.

The Republic of Uzbekistan is one of the Central Asian countries in terms of electricity generation. During the former Soviet Union, it also supplied electricity to neighboring Tajikistan, Kyrgyzstan, Turkmenistan and Kazakhstan. Since the country gained independence, the demand for electricity has also increased sharply as a result of population growth and the development of industry and manufacturing sectors. The change in electricity capacity by 2030 is shown in Figure 1

As in many countries, the electricity sector in the Republic of Uzbekistan is financed and managed by the state.

**Table 1: Primary fuel and energy resources per individual (data of the Statistics Committee of the Republic of Uzbekistan. <https://stat.uz/en/>)**

Name	2000	2003	2006	2009	2012	2015	2018	2019
In the Republic of Uzbekistan	2,2	2,2	2,2	2,2	1,8	1,6	1,7	1,6
Oil and Gas condensate	0,3	0,3	0,2	0,2	0,1	0,1	0,1	0,1
Natural Gas	1,9	1,8	1,9	2,0	1,7	1,4	1,5	1,5
Coal	0,03	0,02	0,03	0,04	0,03	0,03	0,04	0,03
Hydroelectric station	0,01	0,03	0,02	0,02	0,02	0,02	0,02	0,02

**Figure 1: Change of installed capacity in 2019-2030, MW (Source: The concept of electricity supply of the Republic of Uzbekistan in 2020-2030, <https://minenergy.uz/en/lists/view/77>).**

The main factors determining the need for state management of the electricity industry include: the status of the economy as a life-support sector; existence of natural monopolies in the electricity industry; the need for liberalization of energy markets in accordance with the objective laws of development; the need to coordinate long-term plans for the development of the electricity industry and other sectors; environmental pollution.

As a result of our research, the analysis of the state of gross electricity consumption in the country in 2017-2020 shows that the total electricity consumption in 2017 was 60180,8 million kWh. this figure is 69021,1 million kWh in total by 2020 year, if it is one hour. hours are consumed by electricity energy. Also in Table 2, we can see the analysis of the state of gross electricity consumption in the regions of our country in the table below.

The analysis of the state of electricity production in 2017-2020 years by our country shows that the total electricity consumption in 2017 was 60820,1 million kWh. this figure is 66500,7 million kWh in total by 2020 year, if it is one hour. hours are consumed by electricity energy. Also in Table 3, we can see the analysis of the state of our country's electricity production in the table below.

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## 5 CONCLUSION

The development of the electricity sector in the Republic of Uzbekistan is important not only for Uzbekistan but also for Central Asia. Because the geographical location of Uzbekistan is the most favorable for this area.

For Central Asian countries, the development of the electricity market in the territory of Uzbekistan will serve to increase the volume of industry and production in these countries, increase the range of export products. At the same time, we consider it expedient to use the experience of European countries in developing a strategy for the advancement of the electricity market in the region. This is because the geographical location of these two regions has similar aspects. This means that the demand for electricity is high in this area.

Achieving efficiency in the electricity sector mainly includes: ensuring return on investment; the cheapest and highest quality choice of location of new facilities and fuel selection; reimbursement of production costs at market prices; setting the most reasonable prices in terms of energy consumption by consumers and recovery of consumer electricity costs.

**Table 2: Analysis of the state of electricity consumption by the country in 2017-2020 in mln. kW. Hours (data of the Statistics Committee of the Republic of Uzbekistan. <https://stat.uz/en/>)**

Regions name	2017 year	2018 year	2019 year	2020 year
Total for the Republic of Uzbekistan:	60180,8	62895,5	64844,0	69021,1
including:				
Ether energy consumption (consumption of consumer berylgan) mln. kW. hours				
Republic of Uzbekistan	46746,3	60744,8	54174,8	53 839,8
Republic of Karakalpakstan	1088,7	1578,3	1690,1	1 372,9
regions				
Andijan	2639,5	3975,4	2627,3	3 479,5
Bukhara	2678,2	3338,8	2437,0	3 112,9
Jizzakh	1581,4	2177,8	1924,4	1 768,6
Kashkadarya	5116,1	5561,3	5594,6	5 169,2
Navoi	7002,6	7431,4	8775,3	7 920,8
Namangan	2789,6	3898,9	3099,1	3 597,2
Samarqand	3247,8	4425,8	2769,7	4 130,1
Surhandarya	2230,9	5653,0	2364,3	2 633,5
Syrdarya	1159,4	1455,1	1748,9	1 283,2
Tashkent	7235,1	8868,5	9253,6	7 358,5
Fergana	3534,0	4965,3	4591,8	4 787,7
Khorezm	1118,1	1799,3	1765,7	1 558,5
Tashkent city	5325,0	5615,8	5532,9	5 667,2

**Table 3: Analysis of the state of electric energy production in the Republic of Uzbekistan for 2017-2020 years (mln. kW. hours) (data of the Statistics Committee of the Republic of Uzbekistan. <https://stat.uz/en/>)**

Name of the company	2017 year		2018 year		2019 year		2020 year	
	Number of enterprises	(mln. kW. hours)	Number of enterprises	(mln. kW. hours)	Number of enterprises	((mln. kW. hours)	Number of enterprises	(mln. kW. hours)
Total production	68	60 820,1	55	62 896,6	57	63 531,6	49	66 500,7
including by types of power plants								
Electricity produced by thermal power plants (except for TPCs)	19	51 141,8	18	55 470,6	18	55 080,1	13	54 382,4
Thermal power centers (TPC) generating electrical energy	5	1 250,9	5	1 039,7	6	1 463,5	6	6 625,8
Electricity produced by hydro power plants	15	7 929,6	15	5 897,3	16	6 462,0	17	4 999,2
Electricity produced by solar power plants	10	0,7	3	0,2	3	0,1	1	0,03
Electricity produced by other methods (except for electricity generated from the combustion of waste products)	19	497,2	14	488,8	13	510,4	12	493,3
Wind power generating electricity	-	-	-	-	1	15,5	-	-

The main mechanisms of state regulation in the electricity sector include:

- Structural policy and institutional changes in the fuel and energy sector;
- Coordinated tariff, tax, customs and antitrust policies;
- Management of state property;
- Introduction of new technical norms, national standards and norms and strengthening control over their implementation;
- Encouragement of strategic initiatives of economic entities in the field of investment, innovation and energy saving.

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