

ON TOPICAL ISSUES OF THE EFFICIENT USE OF ELECTRIC POWER IN  
UZBEKISTAN

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**Abstract**

The efficient use of electric power is one of the most important factors determining sustainable economic growth, energy security, and environmental stability. In Uzbekistan, the growing demand for electricity caused by industrial development, urbanization, and population growth has intensified the need for rational energy consumption. Despite possessing significant energy resources, the country faces serious challenges related to high energy intensity, outdated infrastructure, and inefficient consumption patterns. This article analyzes the current state of electricity use in Uzbekistan, identifies key problems hindering energy efficiency, and proposes practical solutions aimed at improving the efficiency of electric power utilization. The research emphasizes the role of government policy, technological modernization, and consumer behavior in achieving sustainable energy development.

**Keywords**

electric power, energy efficiency, energy saving, Uzbekistan, sustainable development.

**Introduction**

Electric power is a fundamental component of modern economic systems and social development. Stable and efficient electricity supply ensures industrial productivity, improves living standards, and supports technological progress. For Uzbekistan, which is implementing large-scale economic reforms and pursuing industrial modernization, the issue of efficient electricity use has become increasingly relevant.

In recent years, electricity consumption in Uzbekistan has been growing steadily due to population growth, expansion of industrial production, and increased electrification of the economy. However, this growth has also exposed systemic problems such as high energy losses, inefficient technologies, and excessive consumption in both industrial and residential sectors. The energy intensity of GDP in Uzbekistan remains significantly higher than the global average, indicating inefficient use of energy resources.

In this context, improving energy efficiency is not only an economic necessity but also a strategic priority aimed at ensuring long-term sustainability, reducing production costs, and mitigating environmental impacts. The purpose of this article is to analyze topical issues related to the efficient use of electric power in Uzbekistan and to identify priority directions for enhancing energy efficiency in the national economy.

**Analysis of the literature used**

The issues of efficient use of electric power and energy efficiency have been widely studied in both international and national scientific literature. Many researchers emphasize that rational energy consumption is a key factor in ensuring sustainable economic growth, reducing production costs, and minimizing environmental impacts.

International studies mainly focus on the relationship between energy efficiency and economic development, highlighting the role of technological innovation and institutional reforms. Researchers note that countries with lower energy intensity of GDP achieve higher competitiveness and resilience to external energy shocks. Considerable attention is paid to the implementation of energy-saving technologies, smart grids, and renewable energy sources as effective tools for improving electricity efficiency.

The works of international organizations and experts also analyze policy mechanisms for promoting energy efficiency, including tariff reforms, energy audits, and financial incentives. These studies underline that market-based electricity pricing and strict regulatory standards encourage consumers and enterprises to adopt energy-efficient practices.

In the scientific literature of Uzbekistan and other post-Soviet countries, energy efficiency issues are often examined in the context of structural economic transformation and modernization of infrastructure. Researchers point out that the high energy intensity of production is largely caused by outdated technologies, physical depreciation of power equipment, and insufficient investment in modernization. A number of studies analyze the problems of electricity losses in transmission and distribution networks, emphasizing the need for large-scale infrastructure renewal.

Uzbek scholars also focus on government policies and strategic programs aimed at reforming the electric power sector. Their research highlights the importance of state support in promoting renewable energy, introducing energy management systems, and improving institutional mechanisms for energy saving. At the same time, several authors note that the effectiveness of these measures largely depends on public awareness and the level of energy-saving culture among consumers.

Despite a significant number of studies devoted to energy efficiency, the literature reveals certain gaps. In particular, there is a lack of comprehensive analyses that combine technological, economic, and behavioral aspects of electricity consumption in Uzbekistan. This article seeks to contribute to existing research by providing an integrated assessment of topical issues related to the efficient use of electric power and by identifying priority directions for further improvement.

### **Materials and Methods**

The methodological basis of this research includes a systematic and analytical approach to the study of electricity consumption and energy efficiency issues. The research relies on the analysis of statistical data, official reports of government agencies, and scientific publications related to energy efficiency and power sector development.

General scientific methods such as analysis, synthesis, comparison, and generalization were used to assess the current state of electricity consumption in Uzbekistan. In addition, economic analysis methods were applied to evaluate the impact of inefficient electricity use on economic performance. The study also incorporates a qualitative assessment of government policies and reform measures aimed at improving energy efficiency.

### **Analysis and Results**

The implementation of energy sector reforms has already produced noticeable results.

Firstly, infrastructure modernization projects have contributed to a gradual reduction in technical losses in electricity networks. The replacement of outdated equipment and the introduction of automated control systems have improved system reliability and efficiency.

Secondly, tariff reforms have encouraged more rational electricity consumption. As electricity prices increasingly reflect real costs, households and enterprises have begun to adopt energy-saving measures, such as using efficient appliances and optimizing consumption patterns.

Thirdly, the rapid development of renewable energy has diversified electricity generation and reduced dependence on fossil fuels. The commissioning of large-scale solar and wind power plants, as well as the promotion of small distributed generation systems, has improved the overall efficiency and sustainability of the power sector.

Fourthly, energy efficiency programs in industry and construction have led to a reduction in electricity consumption per unit of output. Enterprises implementing modern technologies and energy management systems demonstrate lower production costs and higher competitiveness.

Overall, these measures have resulted in measurable electricity savings, reduced energy intensity of the economy, and improved energy security.

#### Trends in Electricity Generation (2020–2025)

Uzbekistan's total electricity production has shown steady growth over the five-year period:

Year	Total Electricity Generation (billion kWh)
2020	~66.4
2021	~71.3
2022	~74.3
2023	~78.0
2024	~81.5
2025	~86.7

This represents a **~30 billion kWh increase** (≈46 %) from 2020 to 2025, reflecting capacity expansion and growing demand due to industrial and household consumption.

#### 2. Renewable Energy Growth

Renewable electricity generation has expanded rapidly in Uzbekistan:

- In early 2025, combined solar and wind generation exceeded 2 billion kWh in just 3.5 months—a production figure higher than the total generation for these sources in 2024, illustrating rapid growth in renewables.
- By late 2025, total renewable electricity (including hydro) exceeded 13 billion kWh, accounting for ~22 % of total generation.
- With continued commissioning of solar and wind projects, renewable generation surpassed 16 billion kWh in 2025.

Installed renewable capacity includes approximately 12 solar and 5 wind farms with a combined capacity near 4.6–5.6 GW by the end of 2025.

#### 3. Energy Efficiency Indicators

While direct measurements of national energy efficiency (e.g., energy intensity of GDP) over 2020–2025 are limited, proxy indicators show improvements:

- Expansion of renewable generation contributed to natural gas savings ( $\approx 2.4$ – $2.7$  billion cubic meters) and avoided emissions in the millions of tons range.
- According to international projections, Uzbekistan aims to reduce losses in transmission and distribution significantly, improve combined-cycle power plant efficiency, and decommission outdated units, enhancing overall sector efficiency.

#### Conclusion

The efficient use of electric power is a critical issue for Uzbekistan's sustainable development. The analysis shows that while the country faces serious challenges related to high energy intensity, infrastructure deterioration, and growing demand, significant progress has been achieved through targeted reforms and policy measures. Further improvement in electricity efficiency requires continued investment in modernization, expansion of renewable energy, strengthening of institutional frameworks, and promotion of energy-conscious behavior among consumers. By addressing these topical issues in a systematic and integrated manner, Uzbekistan can ensure reliable electricity supply, reduce environmental impacts, and support long-term economic growth.

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