ECONOSCITECH INTEGRATION

ISSUE 9

INTERNATIONAL SCIENTIFIC
ELECTRONIC JOURNAL

TASHKENT STATE UNIVERSITY OF ECONOMICS

American University of Technology
Powered by Arizona State University®

ISSN: 3060-5075

Acceptance of articles
PUBLISHED EVERY MONTHLY

ARTICLE CONTRIBUTORS
PROFESSORS-TEACHERS, SPECIALISTS AND SCIENTIFIC RESEARCHERS.

Google scholar

OpenAIRE

ISSN INTERNATIONAL STANDARD SERIAL NUMBER DENMARK

CONTACT: +998 94 3540880 https://econoscitech-integration-journal.uz

2026

THE SCIENTIFIC-POPULAR ELECTRONIC JOURNAL **"ECONOSCITECH-INTEGRATION"** HAS BEEN REGISTERED UNDER THE NUMBER C-5669651 BY THE AGENCY FOR INFORMATION AND MASS COMMUNICATIONS (AOKA) OF THE REPUBLIC OF UZBEKISTAN, EFFECTIVE FROM OCTOBER 9, 2024.

In accordance with Resolution No. 384/6 dated April 10, 2026, issued by the Presidium of the Supreme Attestation Commission under the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan, this journal is included in the list of recommended international scientific publications for publishing the primary research findings of doctoral dissertations in the field of Economic Sciences.

Partners: Tashkent State University of Economics / American University of Technology in Tashkent (AUT)

Electronic publication. Issue 9. 500 pages.
Approved for publication in September 2026.

Editorial Board Members:

CONTENTS

GROWTH TRENDS IN ELECTRICITY CONSUMPTION IN UZBEKISTAN AND PROBLEMS OF MODERNIZING THE GRID INFRASTRUCTURE

Bobobekov Ergash Abdumalikovich
Tashkent State University of Economics,
Department of "Green Economy"
ergashbobobekov@gmail.com

Abstract. This article examines the rapid growth of electricity consumption in Uzbekistan during 2016–2026, the condition of the national grid infrastructure, and the economic challenges of its modernization. Electricity consumption increased from 45.7 billion kWh in 2016 to approximately 71 billion kWh in 2025, representing growth of more than 55 percent. The study applies dynamic statistical analysis, comparative assessment, infrastructure-loss analysis, and demand forecasting. The findings indicate that ageing network assets, technical losses estimated at 10–15 percent, and insufficient investment constrain supply reliability. By 2030, electricity demand may reach 90–100 billion kWh. The modernization agenda therefore requires the development of high-voltage transmission lines, upgrading 325 substations, modernization of more than 106,000 transformer points, wider smart-grid deployment, and expansion of distributed renewable-energy systems. The paper argues that tariff reform, targeted social protection, international financing and public-private partnerships should be coordinated with digital grid modernization to improve energy security and long-term economic sustainability.

Keywords. Electricity consumption, grid infrastructure, energy security, modernization, technical losses, smart grid, investment, distributed energy, Uzbekistan.

INTRODUCTION

Electricity is a fundamental input of the modern economy. Industrial production, transport, communications, information technologies, services and household activity depend on stable and affordable power supply. For Uzbekistan, rapid economic growth, industrialization and population growth have intensified the pressure on the electricity system. The expansion of productive capacity and household consumption has therefore turned the balance between demand growth and infrastructure capability into a major economic-policy issue.

During the period under review, demand expanded faster than a substantial part of the grid could be renewed. The source material reports that approximately one third of the electricity network requires modernization. Ageing equipment, technical losses and unevenly distributed capacity reduce supply quality and create additional costs for enterprises and households.

The purpose of this study is to analyze electricity-consumption trends in Uzbekistan, identify the principal weaknesses of grid infrastructure, assess the economic implications of supply interruptions, and formulate modernization priorities up to 2030. Particular attention is paid to smart-grid technologies, investment mechanisms, tariff reform and distributed renewable-energy systems.

LITERATURE REVIEW

Energy-demand economics distinguishes between electricity itself and the energy services that consumers ultimately require, such as lighting, heating, cooling and mobility. Lovins (1977) emphasized the importance of meeting these services through efficient technologies rather than simply expanding energy supply. Stern (2004)

further demonstrated that the relationship between economic growth and energy use changes as economies become technologically more efficient.

Infrastructure investment can generate broader macroeconomic effects. The source material refers to IMF estimates suggesting that infrastructure investment multipliers in developing economies may reach 1.5–2.0. This implies that electricity-network modernization can influence not only sector performance but also production, investment and employment across the wider economy.

International experience demonstrates the importance of reliability indicators and digital grid technologies. SAIDI is widely used to measure interruption duration. The supplied study contrasts very low interruption durations in Belgium and Germany with substantially higher levels in Uzbekistan. Experiences from China and India also show that large-scale grid investment, loss reduction and utility reform can improve reliability and financial sustainability.

RESEARCH METHODOLOGY

The study is based on the information base provided in the source document: official statistics of the Ministry of Energy of Uzbekistan, International Energy Agency country information, World Bank and Asian Development Bank project materials, Enerdata, relevant academic studies, and analytical materials published in 2026.

The methodological framework combines dynamic statistical analysis for 2016–2026, assessment of the mismatch between electricity demand and supply capability, international comparative analysis, evaluation of infrastructure-investment effects, and a forecast of electricity demand to 2030. The analysis also compares per-capita consumption, network losses and interruption-duration indicators across selected countries.

The 2030 demand interval of 90–100 billion kWh is retained from the supplied study. In Figure 1, the midpoint of this interval is displayed only for visual presentation; it should not be interpreted as a separate point forecast.

ANALYSIS AND RESULTS

Uzbekistan's electricity consumption increased from 45.7 billion kWh in 2016 to about 71.0 billion kWh in 2025. This corresponds to growth of more than 55 percent in nine years. The source attributes this expansion to population growth, annual GDP growth, industrialization and wider use of electricity-consuming household and digital technologies. Demand is expected to continue increasing and may reach 90–100 billion kWh by 2030.

The sectoral structure of consumption also matters for modernization policy. Industry accounts for approximately 40–45 percent of consumption, households for 30–35 percent, services and trade for 15–20 percent, and agriculture for 8–12 percent. During the summer peak, cooling demand can increase system load by 25–30 percent above the base level, intensifying stress on distribution infrastructure (table 1; figure 1).

Table 1
Electricity Consumption Dynamics and Forecast in Uzbekistan

Year	Consumption (bn kWh)	Population (million)	Per capita (kWh)
2016	45.7	31.5	1,451
2018	52.4	32.7	1,602
2020	56.8	33.7	1,685
2022	63.1	35.0	1,803
2024	68.4	36.1	1,894
2025	-71.0	36.5	-1,945
2030 (forecast)	90–100	38.5	-2,400

Source: compiled from the data contained in the supplied study; the 2030 range is the author's forecast reported in that study.

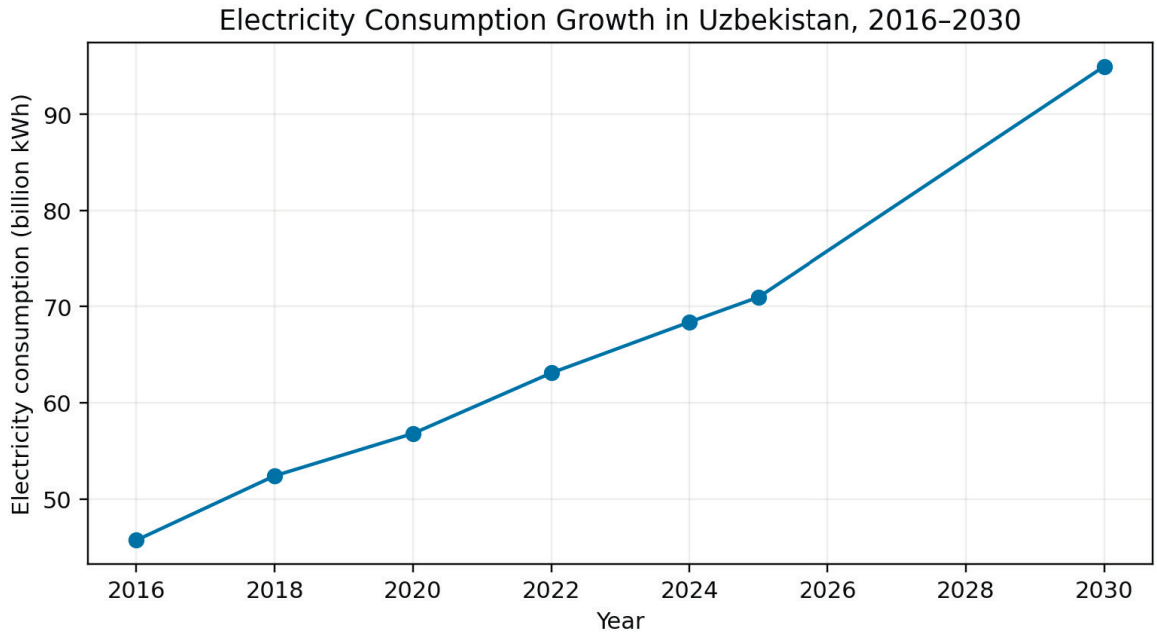

Figure 1. Electricity Consumption Growth in Uzbekistan, 2016–2030 (2030 plotted at the midpoint of the stated 90–100 billion kWh range).

The infrastructure indicators reveal a significant modernization gap. The source reports 29,000 km of electricity networks, 195 substations and more than 9,000 transformer points, while a much larger stock of transformer equipment requires renewal. Technical losses are estimated at 10–15 percent, compared with approximately 4–6 percent in the European benchmark cited in the source. At 71 billion kWh of consumption, a 10 percent loss corresponds to about 7.1 billion kWh, illustrating the economic scale of inefficiency.

Reliability problems create direct and indirect costs. The supplied study estimates that improved electricity reliability could prevent losses equivalent to roughly 0.3–0.5 percent of GDP and, using the GDP assumption contained in the source, places the potentially avoidable annual loss at approximately USD 270–450 million. These values should be treated as scenario-based estimates rather than audited national-loss statistics.

The 2025–2030 modernization agenda described in the source includes development of 241 and 500 kV high-voltage transmission lines, construction or reconstruction of 325 substations in the 25–110 kV range, and modernization of more than 106,000 transformer points. The program also seeks to reduce technical losses toward international benchmarks through smart meters and smart-grid technologies.

Digitalization is central to this transition. Smart grids can provide real-time monitoring, automated fault detection, remote meter reading and improved demand-supply balancing. The source reports international evidence that smart-grid deployment can materially reduce technical losses. For Uzbekistan, these technologies are especially relevant because rapidly rising peak demand makes conventional capacity expansion alone increasingly costly.

Distributed renewable-energy systems can complement centralized grid investment. The supplied study reports that more than 45,000 households have installed solar panels. Such systems can reduce pressure on the central grid and, where regulatory and technical conditions permit, supply electricity during daytime peak periods. This creates a foundation for more advanced distributed-energy and virtual-power-plant arrangements.

Tariff and subsidy reform remains an economic component of modernization. Historically, tariffs that did not fully cover production and distribution costs weakened the sector's ability to finance infrastructure renewal. A gradual transition toward cost-reflective tariffs, combined with targeted support for vulnerable households, can improve investment incentives without abandoning social protection. International financial institutions and public-private partnership mechanisms can complement domestic financing (table 2).

Table 2
Comparative Indicators of Electricity Systems

Country	Per-capita use (kWh)	Grid losses (%)	SAIDI (min/year)
Belgium	7,200	4.5	3.4
Germany	6,100	3.8	12.2
South Korea	10,200	3.5	9.5
Kazakhstan	5,100	9.2	~80
Uzbekistan	~1,945	10–15	>100
Tajikistan	~2,200	13.4	~120
India	~1,200	18.5	~180

Source: comparative figures reproduced from the supplied study, which attributes them to IEA, World Bank, Enerdata and related sources.

CONCLUSION AND SUGGESTIONS

The analysis confirms a widening economic tension between electricity-demand growth and the condition of Uzbekistan's grid infrastructure. Consumption rose by more than 55 percent between 2016 and 2025 and may reach 90–100 billion kWh by 2030. Without accelerated modernization, ageing network assets and high technical losses can increasingly constrain industrial growth, household welfare and investment activity.

The modernization strategy should combine physical renewal with digital transformation. Priority measures include high-voltage network development, substation and transformer modernization, smart-grid and smart-meter deployment, improved energy-efficiency standards, and expansion of distributed solar generation. These measures can reduce losses, improve reliability and make the system more responsive to peak demand.

Financing and institutional reform are equally important. Gradual tariff reform, targeted subsidies, transparent utility management, cooperation with international financial institutions and wider use of public-private partnerships can strengthen the investment base of the sector. The overall policy objective should be to align electricity infrastructure growth with projected demand while simultaneously improving efficiency, digital controllability and energy security.

REFERENCES

1. Asian Development Bank (2024). Uzbekistan Power Transmission Improvement Project. ADB Project No. 47296-001.

2. Asian Development Bank (2024). Modernization of Electricity Distribution Systems. ADB Project No. 58309-001.

3. Coady, D., Parry, I., Le, N., & Shang, B. (2019). Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates. IMF Working Paper 19/89.

4. International Energy Agency (2021). Net Zero by 2050: A Roadmap for the Global Energy Sector.

5. International Energy Agency (2022). Uzbekistan Energy Profile.

6. International Energy Agency (2023). Unlocking Smart Grids in Emerging Economies.

7. International Monetary Fund (2014). Is It Time for an Infrastructure Push? The Macroeconomic Effects of Public Investment.

8. Lovins, A. B. (1977). Soft Energy Paths: Toward a Durable Peace.

9. Stern, D. I. (2004). The Rise and Fall of the Environmental Kuznets Curve. World Development, 32(8), 1419–1439.

10. World Bank (2022). Electricity Sector Transformation and Resilient Transmission: Uzbekistan. Project P162929.

11. World Bank (2025). Uzbekistan to Invest in Modernizing Electricity Distribution Networks with World Bank Support.

12. Ministry of Energy of the Republic of Uzbekistan (2026). Official statistical information.

13. Enerdata (2025). Uzbekistan Energy Information.

14. "Yangi O'zbekiston" newspaper (2026, July 4). Electricity consumption: demand is growing, what about supply?

15. Yusupov, A. (2023). Energetika xavfsizligi va iqtisodiy barqarorlik: O'zbekiston misolida. O'zbekiston Milliy universiteti ilmiy axborotnomasi, 2023(1), 112–119.

Proofreader: Xondamir Ismoilov

Layout and Designer: Hasan Maqsudov

2026. № 9

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

Our address: Tashkent city, Yunusobod district, 19th block, House 17.