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Assessment of the Effective Investment Policy in Enegry Sector of Uzbekistan

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Abstract: Implementation of investment projects in the fuel and energy industry plays active role in economic development. An active involvement of private capital in the processes of extraction and production of energy resources establishing cooperation with financial capital. While modern methods of investing innovative energy sector increases effective energy consumption in Uzbekistan. Therefore, the current study dented for innovative activity in the fuel and energy complex such as technological processes, coal, gas, oil for thermal energy and hydropower stations in Uzbekistan. Investment in the fuel and energy complex are characterized by a long period of commissioning of capacities which increases the payback period of capital investments for further improvement energy consumption. Main outcomes can be relationship between gas production, coal production in agriculture sector while thermal plants and hydraulic plant nonpositive relationship on total energy consumption in Uzbekistan.

Keywords: Investment Policy, Total Energy Consumption, Economic Sectors, Natural Energy Resources.

1. Introduction

In recent years, large-scale reforms have been carried out in the country, aimed primarily at the accelerated development of all sectors of the economy, increasing investment attractiveness and business activity, expanding production and the service sector. At the same time, a number of systemic problems in the organization of public administration in the energy sector impede the effective implementation of the planned reforms and the accelerated innovative development of the country, in particular. Lack of coordination and a systematic approach to the issues of the associated development of the fuel and energy complex and the diversification of energy sources increases the risks of sustainable energy supply to the sectors of the economy and the population of the country, taking into account their growing demand; Directive model of management of energy industry organizations, excessive administrative regulation of the financial and economic activities of companies, as well as the irrational use of labor resources reduce the efficiency and effectiveness of their work, lead to an increase in non-production costs and costs per unit of energy generated. The lack of a healthy competitive environment, the presence of a significant quasi-public sector and the conflict of state and commercial interests, the inconsistency of tariff regulation measures with investment policy negatively affect the investment attractiveness of the fuel and energy sector;
Development of the industry is limited by system-wide problems, such as high wear and tear of equipment and the slow pace of renewal of the relevant infrastructure, operation of equipment, installations, gas pipelines and power lines with violation of service life, unstable financial situation, low level of implementation of resource- and energy-saving technologies, which leads to an increase in technological losses and systematic interruptions in the supply of fuel and energy resources, especially in the field. Poor work on the introduction of automated systems for planning enterprise resources, monitoring and accounting for supplied energy resources and other modern information and communication technologies at industry enterprises leads to high losses in the supply of energy resources to consumers and violations in the settlement system. In order to ensure the accelerated development and implementation of an effective management system for the energy industry, increase its competitiveness and investment attractiveness, as well as in accordance with the tasks defined by the Action

Strategy for five priority areas of development of the Republic of Uzbekistan in 2017-2021 and the Concept of administrative reform in the Republic of Uzbekistan. Determine the main directions for the further development of the fuel and energy industry of the Republic of Uzbekistan. Firstly, the implementation of a unified energy policy aimed at ensuring the country's energy security and meeting the growing demand of the country's economic sectors and the country's population for energy resources; Secondly, delimitation of the functions of state regulation and economic activity in the energy sector, improvement of the legal and institutional framework for social and public-private partnerships, development of clear market mechanisms for the implementation of tariff policy and promotion of the principles of a healthy competitive environment on this basis; Thirdly, creating conditions for actively attracting investments, primarily direct foreign ones, in the construction of infrastructure facilities, as well as the modernization, technical and technological re-equipment of industry enterprises; Fourthly, the implementation of the state policy in the field of energy saving and reducing the energy intensity of the economy, stimulating the active introduction of advanced resource and energy-saving technologies in the sectors of the economy and the domestic sector, and the widespread development of alternative energy sources;
Fifthly, the widespread introduction at the enterprises of the energy industry of modern means of automating technological processes, systems for accounting for production, supply, and consumption of energy resources;
Sixth, optimization of the management system of enterprises in the industry, their structures and divisions, the introduction of modern methods of organizing work and target indicators (quality management, indicative planning) aimed at achieving specific results.

2. Literature review

One of the main priority issues for the development of the electric power industry in Uzbekistan is the development of generating capacities in such areas as thermal power plants (TPP), nuclear energy, renewable energy sources (RES) with the attraction of foreign direct investment. Another important project is being implemented at an accelerated pace in the country - "Introduction of an automated system for accounting and control of electricity (ASKUE)". In particular, by the end of 2020, more than 7 million consumers will be connected to the Automated Electricity Control and Metering System. In accordance with this task, as of May 15, 2020, 3 million 320 thousand units of modern electric meters were installed in the republic. Work is underway on the implementation of a number of investment projects on the terms of public-private partnership (PPP), including in the construction of photovoltaic (solar) stations. The Ministry of Energy also aims to continuously promote energy conservation, introduce appropriate technologies and increase public awareness of the importance of energy conservation. According to the specialists of the Uzenergoinspektsiya, today each house has the opportunity to save an average of 400 kWh of electricity per year, which in the whole country will amount to 1.8 billion kWh. The energy saved in this way will be enough, for example, to provide electricity to the Jizzakh or Syrdarya regions during the year. Resilience can be interpreted here as the ability of the supply chain to complement traditional risk processes (Fiksel, 2015) and potentially offset the severity of supply chain vulnerabilities. Due to their limited resources and capabilities, SME leaders are forced to act sustainably in the face of supply chain risks and disruptions. SME managers therefore need to create an environment where the resilience of their supply chains is regularly assessed and clearly understood in terms of SME capabilities and resources, the effectiveness of their information systems and the availability of funds for SME needs. The study also shows that working with supply chain partners can impact not only the vulnerability of SMEs, but also the resilience of supply chain partners. Furthermore, focusing on continuous assessment of these four areas of SME supply chain resilience can provide SMEs with opportunities to continuously adapt and improve their operations and enhance their ability to withstand potential disruptions(Appiah et al., 2021). Despite such supporting measures, barriers remain in FDI in renewable energy development for wind and solar energy projects and currently pales in comparison with other conventional energy FDI(Mahbub et al., 2022). The growing geographical coverage of investment screening mechanisms is augmented with expanding their competence to cover new sectors and investors as well as making the penalties for transgressions more severe. As a result, a growing share of global transactions are negatively affected by national screening mechanisms(Rajavuori & Huhta, 2020). So, this section of the study aims at investigating the relation between exhaus- tion of energy and financial development. Financial development has a mutual relationship with the degree of capital flows in foreign direct investment (FDI), capital markets, and financial foundations (Marzouk & Fattouh, 2022).
China’s involvement in the chosen renewable-energy sectors in sub-Saharan Africa by providing macro-data and by bringing out key aspects of the organizational models involved in such investment projects, including the key actors and their relationships(Lema et al., 2021). Adopting the concept ‘sense of ownership’, this study explores why some energy investment projects in ASEAN can be successful while other projects are controversial. Studying this issue is critical and timely under China's BRI, which has encouraged its enterprises, both state-owned and private, to make further investment in energy sector in almost all ASEAN countries(Shi & Yao, 2019).

Among others, these include adaptations of final demand for renewable energies and corresponding investments as well as technical and primary input coefficients of the relevant sectors(Wimmer et al., 2023).
In 2021 by Energy Authority of Finland, 90% of companies believed their energy efficiency will improve in next 5–10 years and that the most of their energy efficiency investments would go towards building-technical systems, such as solar power and heat pumps(Knuutila & Vuorio, 2023).
However, depending on prosumagers' price signals and objectives, economic inefficiencies may arise. These relate to sub-optimal investment in the long run, for instance redundant storage infrastructure(Günther et al., 2021).
Based on this literature review, we conclude that optimised renewable and flexibility electricity investments required to drive the decarbonisation of the heating sector have hardly been studied, mainly due to high model complexity and data granularity(Rinaldi et al., 2021).
We propose a model for coupled energy markets that captures long-term investment decisions in transport and production capacity and short-term market decisions. For this kind of model, we determine sufficient conditions that ensure unique market outcomes(Egerer et al., 2022).
Furthermore, it is important to consider that investment in green technologies may lead to competitive advantages as a result of a more efficient use of resources(Maria et al., 2022).
However, in addition to the design, they found that the zero energy projects required a deep renovation with a high investment cost of 2.33 times greater than the typical buildings. These excessive costs could be a significant barrier to invest in ZEB in Thailand(Jareemit et al., 2022)
Dividing the projected investment amounts by the projected TICs and then taking the annual difference, the yearly installed capacity changes are obtained. These installed capacity changes show what would happen if all the investments are channeled to the wind or solar energy sectors, respectively(Akin et al., 2022).
However, it is important to consider specific regional dynamics in the context of specific stimulus measures. In this context, the extent to which green investments as part of the recovery stimulus can contribute to both climate mitigation and specifically energy-sector employment gains remains understudied(Xexakis et al., 2022).
A number of factors are considered critical in ensuring energy efficiency, energy conservation, and awareness improvements among churches. Among them include the knowledge church operators have on energy consumption, investment, pricing, and billing(Akua & Kofi, 2023).

3. Methods and materials

Our research is based on a empirical analysis of investment in different fuel sector over the 11 years. We analyze the investment changes in various energy types in Uzbekistan. Data was time series in 7 independent variables of Uzbekistan by Stat.uz. During the research we used OLS and Lin-log model with Pairwise correlations test. For post estimation analysis we used Shapiro-Wilk test for normal data, Augmented Dickey Fuller test for unit root, Multicollinearity effect results, Heteroskedasticity yline graph of total energy consumption and

4. Results and analysis

Implementation of a unified energy policy aimed at ensuring the country's energy security and meeting the growing demand of the country's economic sectors and the country's population for energy resources. Delimitation of the functions of state regulation and economic activity in the energy sector, improvement of the legal and institutional framework for social and public-private partnerships, development of clear market mechanisms for the implementation of tariff policy and promotion of the principles of a healthy competitive environment on this basis. Creation of conditions for active attraction of investments, primarily direct foreign ones, in the construction of infrastructure facilities, as well as modernization, technical and technological re-equipment of enterprises in the industry.

Table-1. Descriptive statistics of main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
years	20	2010.5	5.916	2001	2020
total consumption	20	53856.23	6091.87	47384.2	69021.12
industry	20	18790.591	1539.739	15007.1	22298.379
construction	20	294.581	288.915	118.6	1448
agriculture	20	12119.664	3386.445	8317.18	18053.9
transport	20	1276.02	214.917	1057.976	2115
government	20	2871.296	1367.813	1433.747	5242.31
population	20	9438.177	3967.407	4034.116	15549.5

gas production	20	60478.119	4116.726	54161.21	68329.4
gas consumption	20	49482.937	3784.742	41524.491	54667.5
coal production	20	3427.235	659.588	1913	4396.82
coal consumption	20	3775.766	1307.423	2195.03	6767.965
thermal plants	16	11351.916	944.725	10749	14031.9
hydraulic plant	16	1806.406	73.009	1709	1914.9
per capita	20	1.855	.069	1.8	2
investment blnuzs	20	10.5	5.916	1	20

Carrying out the state policy in the field of energy saving and reducing the energy intensity of the economy, stimulating the active introduction of advanced resource and energy saving technologies in the sectors of the economy and the domestic sector, the widespread development of alternative energy sources; Widespread introduction at the enterprises of the energy industry of modern means of automation of technological processes, systems for accounting for the volumes of production, supply, consumption of energy resources; Optimization of the management system of enterprises in the industry, their structures and departments, the introduction of modern methods of organizing work and target indicators (quality management, indicative planning) aimed at achieving specific results.

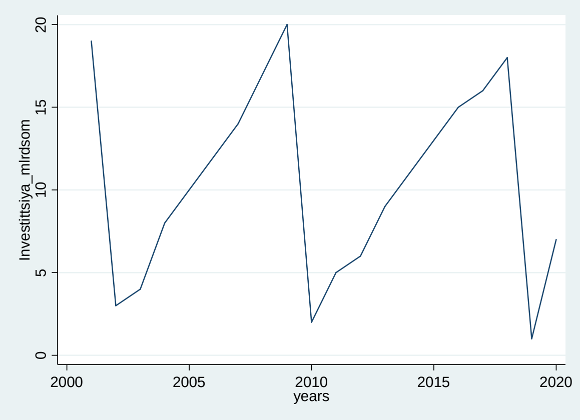


Figure 1. Investment in energy sector line graph

Carrying out the state policy in the field of energy saving and reducing the energy intensity of the economy, stimulating the active introduction of advanced resource and energy saving technologies in the sectors of the economy and the domestic sector, the widespread development of alternative energy sources.

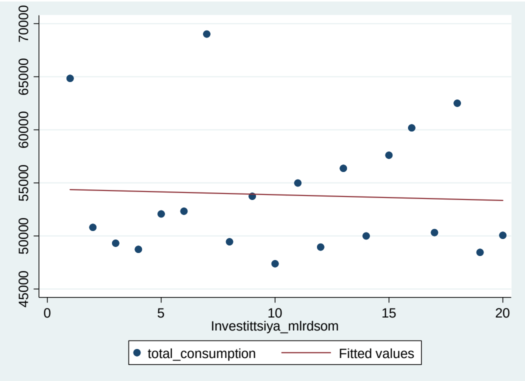


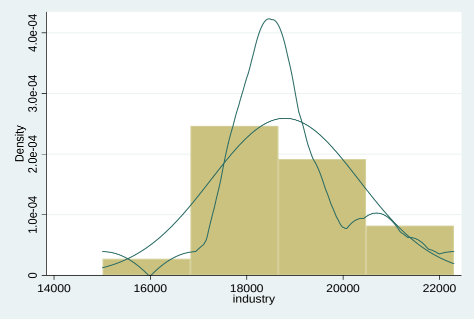
Figure 2. Investment and energy consumption scatter plot

Widespread introduction at the enterprises of the energy industry of modern means of automation of technological processes, systems for accounting for the volumes of production, supply, consumption of energy resources. Optimization of the management system of enterprises in the industry, their structures and departments, the introduction of modern methods of organizing work and target indicators (quality management, indicative planning) aimed at achieving specific results.

Table 2. Pairwise correlations of the variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) total_consumpt~n	1.000							
(2) industry	-0.030	1.000						
	(0.900)							
(3) construction	0.806	-0.042	1.000					
	(0.000)	(0.860)						
(4) agriculture	-0.176	-0.607	-0.244	1.000				
	(0.457)	(0.004)	(0.300)					
(5) transport	0.308	-0.476	-0.081	0.442	1.000			
	(0.186)	(0.034)	(0.736)	(0.051)				
(6) government	0.921	0.048	0.668	-0.291	0.258	1.000		
	(0.000)	(0.840)	(0.001)	(0.214)	(0.273)			
(7) population	0.803	0.106	0.585	-0.604	0.109	0.835	1.000	
	(0.000)	(0.657)	(0.007)	(0.005)	(0.647)	(0.000)		
(8) gas_production	-0.268	-0.367	-0.125	-0.178	0.017	-0.272	0.041	1.000
	(0.252)	(0.112)	(0.598)	(0.452)	(0.945)	(0.246)	(0.862)	
(9) gas_consumption	-0.546	-0.424	-0.253	0.273	-0.047	-0.671	-0.536	0.545
	(0.013)	(0.062)	(0.281)	(0.244)	(0.844)	(0.001)	(0.015)	(0.013)
(10) coal_production	0.703	0.123	0.465	-0.520	0.141	0.739	0.918	0.051
	(0.001)	(0.604)	(0.039)	(0.019)	(0.553)	(0.000)	(0.000)	(0.832)
(11) coal_consumpt~n	0.857	0.110	0.612	-0.227	0.408	0.825	0.734	-0.342
	(0.000)	(0.645)	(0.004)	(0.335)	(0.074)	(0.000)	(0.000)	(0.140)
(12) thermal_plants	0.938	-0.132	0.892	0.069	0.168	0.796	0.637	-0.389
	(0.000)	(0.627)	(0.000)	(0.799)	(0.534)	(0.000)	(0.008)	(0.137)
(13) hydraulic_plant	0.895	0.235	0.601	-0.245	0.256	0.901	0.812	-0.642
	(0.000)	(0.382)	(0.014)	(0.360)	(0.338)	(0.000)	(0.000)	(0.007)
(14) per_capita	-0.065	-0.403	0.049	0.598	0.196	-0.180	-0.483	-0.235
	(0.784)	(0.078)	(0.838)	(0.005)	(0.408)	(0.447)	(0.031)	(0.318)
(15) investment_bl~s	-0.052	0.085	-0.102	0.124	-0.245	0.129	-0.038	-0.190

Increasing the investment attractiveness of the fuel and energy industry through the development of public-private partnerships, improving the tariff policy, stimulating the formation of a favorable competitive and business environment in the energy market. Coordination of the implementation of investment projects in the fuel and energy industry, active involvement of private capital in the processes of extraction and production of energy resources, establishing cooperation with international financial institutions, donor countries, companies, banks and other structures. Promoting the introduction of modern methods of corporate governance in the energy sector, advanced information and communication technologies and automated management, accounting and control systems, ensuring, on this basis, an increase in management efficiency and a reduction in production costs, transparency in the financial and economic activities of organizations in the energy industry.



a)

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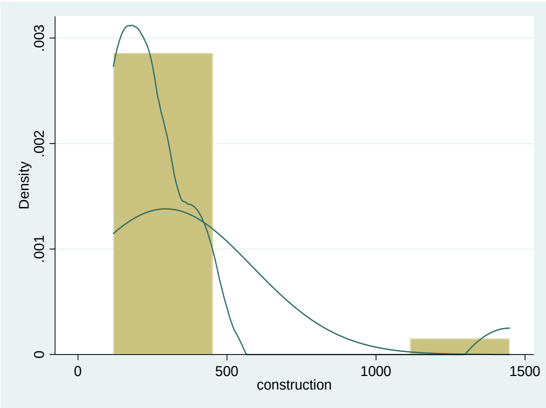

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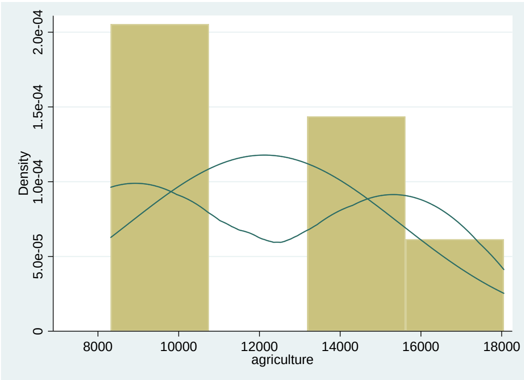

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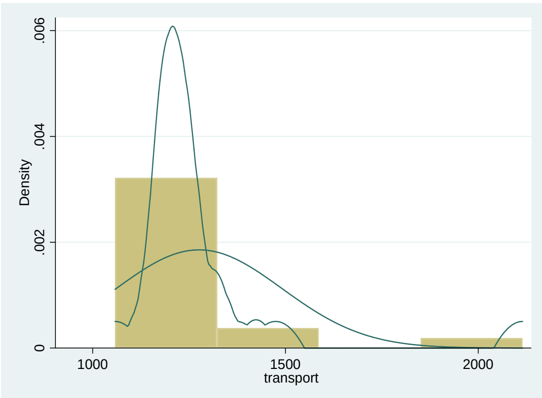

d)

Figure 3. Data distribution in histogram form of ehercy sectors in Uzbekiatan

Stimulating the introduction of innovative technologies into the production processes of organizations in the oil and gas and electric power industries, increasing the level of energy efficiency and saving energy resources. Organization of systematic work on training, advanced training and retraining of engineering, technical and managerial personnel in the energy sector.

Table 3. Shapiro-Wilk test for normal data

Variable	Obs	W	V	z	Prob>z
total_cons~n	20	0.856	3.409	2.472	0.007
industry	20	0.932	1.609	0.958	0.169
construction	20	0.537	10.967	4.826	0.000

agriculture	20	0.823	4.194	2.889	0.002
transport	20	0.577	10.006	4.642	0.000
government	20	0.867	3.146	2.310	0.010
population	20	0.847	3.623	2.594	0.005
gas_produc~n	20	0.964	0.854	-0.318	0.625
gas_consum~n	20	0.937	1.487	0.800	0.212
coal_produ~n	20	0.947	1.246	0.444	0.329
coal_consu~n	20	0.873	3.017	2.225	0.013
thermal_pl~s	16	0.705	5.982	3.553	0.000
hydraulic_~t	16	0.922	1.577	0.905	0.183
per_capita	20	0.851	3.526	2.540	0.006
investment~s	20	0.960	0.938	-0.129	0.551

On the part of the North China Electric Power Project Company at the Electric Power Engineering and Consulting Corporation LLC, a feasibility study was developed for the project “Expansion of the Angren TPP with the construction of a 2x300 MW power unit with a total capacity of 600 MW for burning high-ash coal”.To make a decision on the implementation of the project, a letter No. 20/1495MM dated 12/19/2020 was sent to the Scientific and Technical Council of the Ministry of Energy of the Republic of Uzbekistan by Angren TPP JSC. with an electronic version of the feasibility study of the project, a developed power distribution scheme for the station of two units with a capacity of 300 MW each, and a master plan for new coal-fired power units 2x300 MW on the territory of the Angren TPP.

Table 4 Augmented DickeyFuller test for unit root

Dickey-Fuller test for unit root Number of obs = 19
----------- Z(t) has t-distribution -----------
Test 1% Critical 5% Critical 10% Critical
Statistic Value Value Value
Z(t) -3.551 -2.567 -
1.740 -1.333

p-value for Z(t) = 0.0012
D.

investment_blnuzs	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
investment_blnuzs						
L1.	-0.800	0.225	-3.550	0.002	-1.276	-0.325
_cons	7.918	2.746	2.880	0.010	2.125	13.711

The previously considered project "Expansion of the Angren TPP with the construction of a power unit with a capacity of 130-150 MW with heat extraction for burning high-ash coal (Stage II)" is inefficient in terms of economics (payback period - 25.5 years.). Indicators of conditional integrated efficiency from fuel savings (coal and fuel oil): payback period - 18.4 years. In this regard, it was decided to implement a more efficient investment project, in accordance with the development strategy of TES JSC until 2025, approved by the Advisor to the Prime Minister of the Republic of Uzbekistan, No. 02/1-543 of 10/25/2019. and the program for the implementation of large investment projects in the electric power industry for 2019-2030. No. 06/1-1172 dated April 23, 2019, "Expansion of the Angren TPP with the construction of a 2x300 MW power unit with a total capacity of 600 MW for burning high-ash coal" - implementation period 2022-2026.

Table 5. Linear regression analysis results

total_consumption	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gas_production	.21	.107	1.96	.085	-.037	.456	*
coal_production	2.312	.861	2.69	.028	.328	4.297	**
agriculture	.353	.132	2.67	.028	.048	.657	**
thermal_plants	3.578	.442	8.09	0	2.558	4.598	***
hydraulic_plant	41.417	9.225	4.49	.002	20.145	62.688	***

industry	.279	.263	1.06	.319	-.327	.884	
investment_blnuzs	-13.451	49.719	-0.27	.794	-128.103	101.2	
Constant	-90799.389	20515.02	-4.43	.002	-138107.11	-43491.668	***

Mean dependent var	55072.961	SD dependent var	6250.349
R-squared	0.989	Number of obs	16
F-test	102.151	Prob > F	0.000
Akaike crit. (AIC)	268.001	Bayesian crit. (BIC)	274.182
**** p<.01, ** p<.05, * p<.1*			

When implementing investment projects, SJSC Uzbekenergo attaches great importance to reducing harmful emissions into the atmosphere through the use of more advanced and efficient technological equipment in the production of electricity and increasing the share of renewable energy sources in the energy balance. The program provides for the development of alternative and renewable energy sources, such as wind, solar, hydropower, the introduction of integrated solar-thermal combined cycle power plants

Table 6. Multicollinearity effect results

Variable	VIF	1/VIF
hydraulic_~t	8.39	0.119124
gas_produc~n	3.99	0.250908
agriculture	3.90	0.256552
industry	3.81	0.262349
thermal_pl~s	3.23	0.309488
coal_produ~n	2.93	0.341857
investment~s	1.48	0.677398
Mean VIF	3.96	

In order to rationally use the reserves of fuel and energy resources, develop renewable energy sources, by 2020, work is planned to modernize and improve 19 existing hydroelectric power plants. Durbin-Watson d-statistic (8, 16) = 2.483378. As a result of these works, the station's capacity will increase by 118.5 MW with the production of an additional 600 million kW of electrical energy, and 250 million m3 of natural gas will be saved.

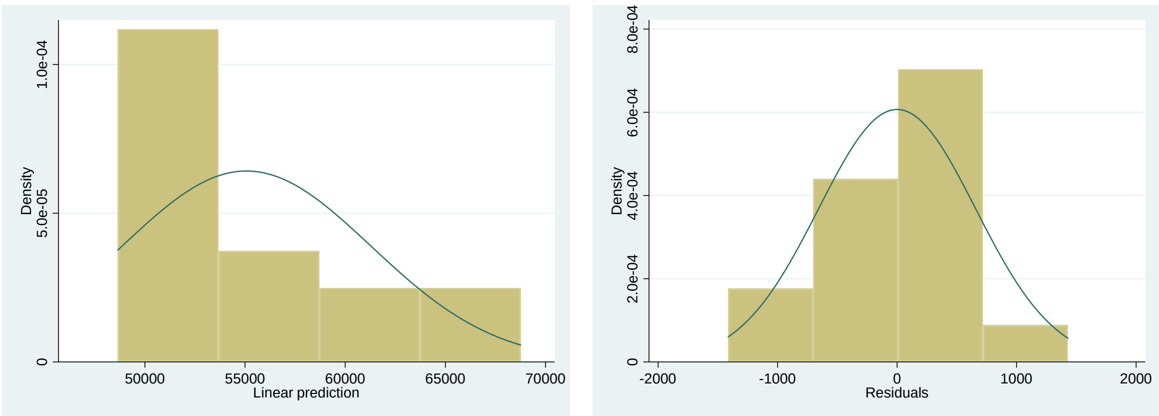

Figure 4. Normal distribution of ehat and yhat post estimation

As part of the project to modernize the electricity metering system with the introduction of an automated control and metering system for electricity consumers, the company provides for the installation of more than 5 million units. modern electronic electricity meters. To implement the project, loans from the Asian Development Bank, the World Bank, the Islamic Development Bank and other investors are attracted.

Table 7. Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj_chi2(2)	Prob>chi2
yhat	16	0.081	0.847	3.550	0.170
ehat	16	0.875	0.279	1.330	0.513

The company also pays special attention to improving the mechanisms for calculating the consumed electricity through the introduction of an automated billing system. As a result of the organization of systematic work in the city of Tashkent, more than 70.0% of payments from the population are accepted on-line.

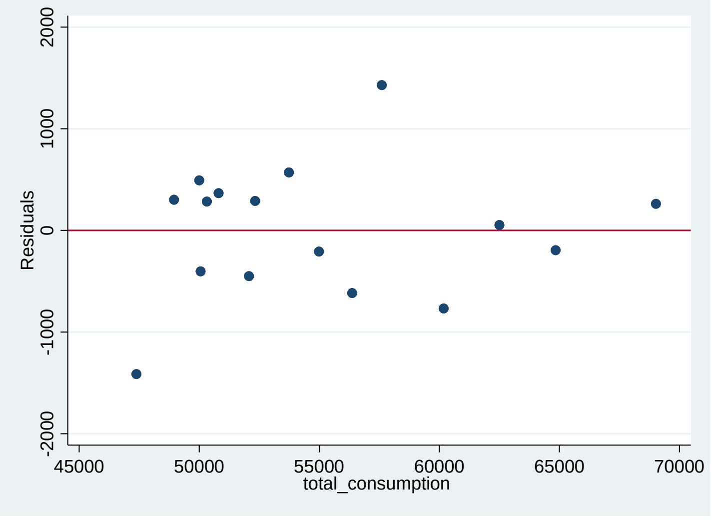

Figure 5. Heteroskedasticity yline graph of total energy consumption

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity while Ho: Constant variance. For variables: fitted values of total_consumption chi2(1) = 0.51 Prob > chi2= 0.4748.

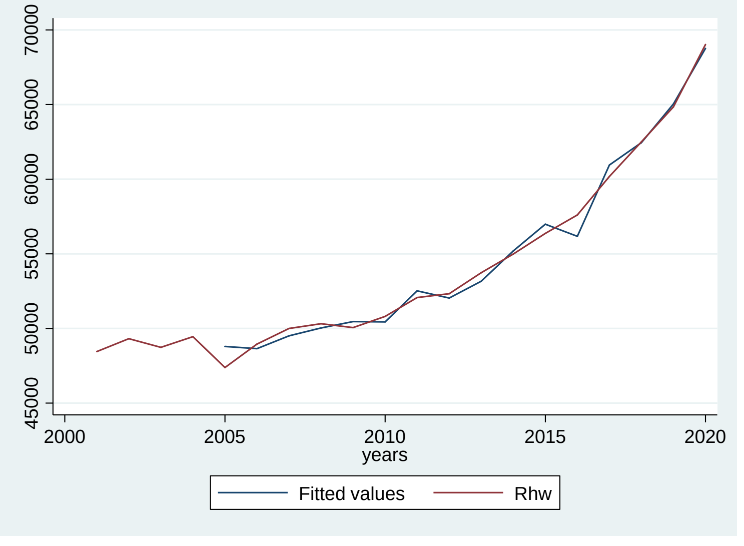

Figure 6. Heteroskedasticity fitted value line graph

As part of the project to modernize the electricity metering system with the introduction of an automated control and metering system for electricity consumers, the company provides for the installation of more than 5 million units. Modern electronic electricity meters. To implement the project, loans from the Asian Development Bank, the World Bank, the Islamic Development Bank and other investors are attracted.

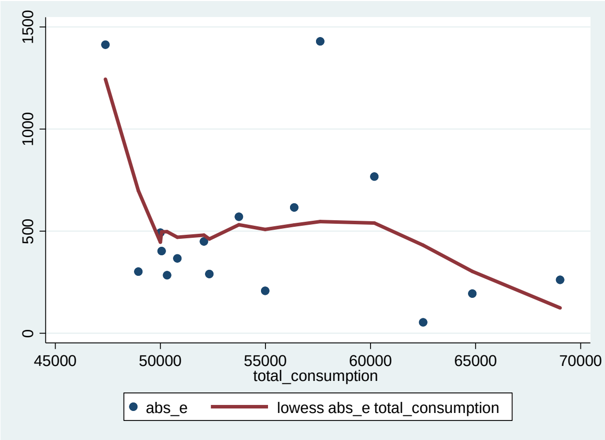

Figure 7. Heteroskedasticity test results

The implementation of measures contributes to the strengthening of the electric power industry, the stable and reliable supply of electricity to consumers, as well as the increase in export potential.

Table 8. Natural logarithm linear regression analysis results

lntotal_consumption	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gas_production	0	0	1.74	.12	0	0	
coal_production	0	0	2.90	.02	0	0	**
agriculture	0	0	2.54	.035	0	0	**
thermal_plants	0	0	6.57	0	0	0	***
hydraulic_plant	.001	0	4.21	.003	0	.001	***
industry	0	0	1.14	.289	0	0	
investment_blnuzs	0	.001	-0.01	.991	-.002	.002	
Constant	8.305	.401	20.69	0	7.379	9.231	***

Mean dependent var	10.911	SD dependent var	0.109
R-squared	0.986	Number of obs	16
F-test	81.501	Prob > F	0.000
Akaike crit. (AIC)	-78.932	Bayesian crit. (BIC)	-72.751

*** *p<.01, ** p<.05, * p<.1*

The fuel and energy complex (FEC) of Uzbekistan is an important area of scientific and technological progress (STP). This area is characterized by its specificity: the diversity of natural and climatic, geological conditions, the economic scale of the consequences of scientific and technological progress and its high social significance, high dependence on raw materials and the associated uncertainty of conditions, the results of innovations, as well as global and local environmental impacts.

5. Discussion

In terms of innovation, energy is considered a conservative industry. In reality, the life of fixed assets is tens of years, and its modernization depends on large investments with long payback periods. Unlike other industries, companies in the energy sector are characterized by low levels of R&D. Nevertheless, innovative development management is an important tool for ensuring the effective growth of all leading international energy companies. Today, the problems of the country's fuel and energy complex are the depreciation of fixed production assets, the depletion of the mineral resource base, the investment unattractiveness of industries, the reduction in geological exploration, and the lagging behind the world level of development of technology and technology.
These technical and economic problems can be eliminated through the development of innovative activities, namely: - the search for new non-hydrocarbon energy sources, which will solve the problem of depletion of the mineral resource base; – Development of new ways of extracting energy from traditional energy raw materials, their more efficient use, which will reduce the energy intensity of GDP;

- discovery of new ways of generating and designing new equipment, which will reduce the degree of depreciation of fixed production assets and the number of accidents for this reason; – implementation of innovative projects, which will increase the investment attractiveness of the industry.
According to studies of cyclical processes in the economy, the development of capital based on innovative ideas occurs at the stage of stagnation. It is innovation that drives the economy to growth and development, to the beginning of a new cycle. At the moment, the global economy is undergoing a change in technological patterns. This circumstance, as well as the decline in economic activity, indicate the possibility of resolving economic problems with the help of innovation.

6. Conclusion

In this article, innovation activity is understood as the search for innovative ideas for the development of technology, technology, management methods and tools, ways of interacting with counterparties, development and implementation of their results at the enterprise to increase the efficiency of its activities and ensure long-term competitive advantage. The following prerequisites for the development of innovative activity in the sectors of the complex can be singled out: Changes in the conjuncture of the world energy markets. A downward wave of cycles in both the national and global economies. Inefficiency of the existing raw material model of the national economy. Change of the leading energy carrier within the framework of the new technological paradigm. Technical and technological backwardness of the industry. High level of depreciation of the main production assets of the complex. High energy intensity of the gross domestic product. The key feature of innovative activity in the fuel and energy complex is the nature of innovation: in most cases, these are process innovations.
Product innovations are not typical for the energy industry due to the technical and economic features of products, the need to strictly comply with established quality indicators (voltage, frequency, steam temperature, octane number, etc.). For this reason, many innovations are not implemented in enterprises focused on generating income in the short term. Along with a long implementation and payback period, innovative projects in the sectors of the complex are characterized by significant capital intensity.

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