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Policy Framework Analysis in the Field of Energy Saving and Relevant Energy Saving Practices in Uzbekistan

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ABSTRACT

The first part of the research was devoted to the analysis of the existing policy framework in the field of energy efficiency and energy saving in Uzbekistan. During the last decade there is an extensive growth of number of policies regarding energy savings and efficiency. But their main focus is on technical and financial aspects of policies deployment. At the same time minor attention is paid to promote public awareness in the field of energy savings and efficiency. The second part of the research was designed to study the application of various energy saving practices among the young adults of Uzbekistan. The research method was a survey with subsequent processing of the results by methods of descriptive statistics. The analysis of conducted survey showed that the most popular energy saving practices in Uzbekistan are either those that are established everyday habits or those that can bring tangible financial benefits considering current economic conditions.

Keywords: Energy Saving, Green Energy, Policy Analysis, Uzbekistan

JEL Classifications: O2, Q2, Q4, Q5

1. INTRODUCTION

The need to country-wide energy transition and focus change on resource conservation led Uzbekistan national authorities to the implementation of fundamental reforms in energy sector. It is anticipated that undertaken measures will give the country a long-term impetus to the transition to an innovative development path.

In Uzbekistan during the last six years, the government implemented several reforms, including reforming the exchange rate and regulating foreign trade, and liberalized prices for various goods and services. Currently, the attention of the authorities is focused on removing structural barriers to GDP growth. For example, emerging markets for factors of production and the dominant role of state-owned enterprises and banks in the country's economy. Today Uzbekistan is developing the following areas as priorities for assisting the country's transition to an inclusive

and sustainable market economy: (1) increase the number of jobs in the private sector; (2) development of human capital; and (3) help the country transition to a greener economic growth model to improve prosperity and climate resilience.

2. POLICY FRAMEWORK ANALYSIS IN THE FIELD OF ENERGY EFFICIENCY AND ENERGY SAVING IN UZBEKISTAN

Uzbekistan is a resource-rich country in Central Asia with large reserves of natural gas, oil and coal. Natural gas represented 91.3% of primary energy production and 98.2% of the country's energy export in 2019, when Uzbekistan exported 20.1% of its produced natural gas. However, to meet the growing internal demand, Uzbekistan imports oil and gas condensate, coal, petroleum products, and electricity. In 2019 fuel imports were five times lower than exports.

One of the most important macro-indicators of the country's economy is the energy intensity of GDP, defined as the ratio of the total consumption of energy resources to the gross domestic product. It represents the amount of fuel and energy resources required for the production in the amount of 1 sum (local currency in Uzbekistan).

The better the standard of living of the population or the level of welfare of the country, the higher the energy consumption per capita and the lower the energy intensity of GDP. In Uzbekistan, the energy intensity of GDP exceeds the energy intensity of developed countries by 3 times. This is caused by the use of technologically obsolete equipment, a high share of fuel and energy resources in the country's exports, relatively low prices for electricity and some types of fuel, an inadequate accounting system for the production and consumption of electricity and energy resources, etc. In current situation, the role of energy efficiency is increasing, the application of which is about 20 times cheaper than the utilization of new energy sources.

According to the forecasted data, domestic demand for energy resources is defined by the expected economic development trends, changes in the structure of national economy and in the level of its energy intensity. Reduced energy intensity of the national economy is the key priority of Uzbekistan's energy policy, and unless this is accomplished, power sector will remain a bottleneck hindering the country's socio-economic development (Figure 1).

Power generation growth rates in 2012-2019 were recorded at 2.6% per annum on average. However, the demand for electrical power was not satisfied in full, with shortages averaging at about 9.4% of demand. Per capita consumption is expected to reach 2,665 kWh per annum by 2030 and, compared to actual consumption of 1,903 kWh in 2018, that features a 71.4% growth. This rate is substantial lower than that of comparator countries in 2018 including Korea (9,711), PRC (4,292), Russia (6,257), Kazakhstan (5,133), Turkey (2,637 kWh). The consumption of electric energy per capita by 2030, according to forecast data, will increase to 2665 kWh per year and compared to actually achieved in 2018 in the amount of 1903 kWh will increase by 71.4% (Figure 2).

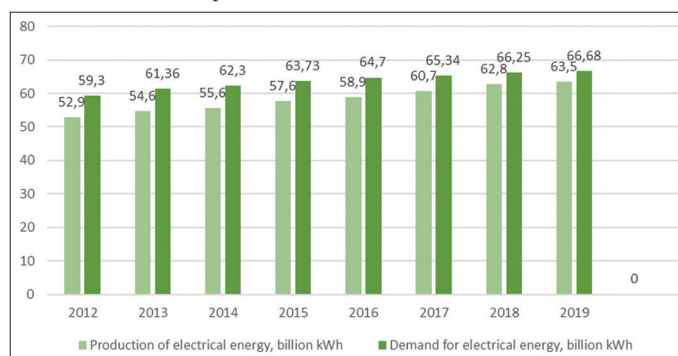
Another groundbreaking document towards energy efficiency of Uzbekistan was released in 2019 titled "On the use of renewable energy sources." It defines the main directions of the state policy in the field of renewable energy sources which include identification of priority areas and implementation of measures in the field of the use of renewable energy sources; development and implementation of the programs in the field of renewable energy sources; strengthening the energy security of the country, diversifying the fuel and energy balance in terms of the production of electrical, thermal energy and biogas using renewable energy sources; stimulating the introduction of innovative technologies, scientific and technical developments in the field of using renewable energy sources, improving energy efficiency, expanding and localizing the production of renewable energy installations; improvement of organizational and legal mechanisms for involving business entities in the creation of generating capacities based

on proven technologies for the use of renewable energy sources; state support and incentives for energy producers from renewable energy sources, as well as manufacturers of renewable energy installations and development of international cooperation in the field of renewable energy sources (On the use of renewable energy sources, 2022).

The share of hydrocarbon fuels in the structure of the energy balance is approximately 86%. By 2030, the share of other energy sources is planned to be increased, since the diversification of energy resources is the key to energy security in the long term. A number of documents focused on the development of nuclear energy and renewable energy sources have been adopted (Table 1).

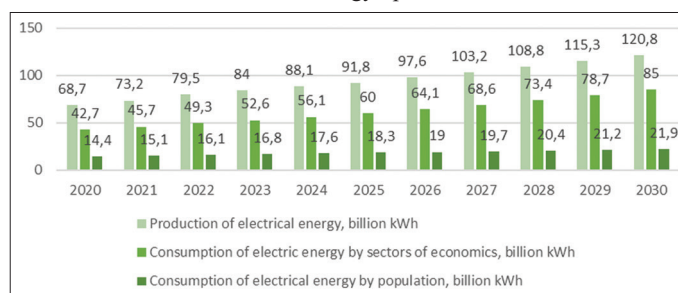
The analysis of the policies mentioned in the Table 1 clearly shows focus on technical, financial and legislative aspects of energy efficiency. The creation of the Ministry of Energy of the Republic of Uzbekistan, formed in accordance with the Decree of the President of the country dated February 1, 2019 No. UP-5646 "On measures to radically improve the management system of the fuel and energy industry of the Republic of Uzbekistan" was necessary in order to facilitate, monitor and control applied measures aimed at security of energy supply, energy efficiency and diversification of energy mix. The Ministry of Energy carries out state regulation of the processes of production, transmission, distribution and consumption of electric and thermal energy, coal, as well as the extraction, processing, transportation, distribution, sale and use of oil, gas and products of their processing. The functions of the Ministry of Energy include the introduction of

Figure 1: Dynamics of production and demand for electrical energy in the period 2012-2019 in Uzbekistan



Source: (International Energy Charter, 2022)

Figure 2: Forecasted dynamics of production and consumption of electrical energy up to 2030



Source: (International Energy Charter, 2022)

Table 1: Recent policies in the field of energy efficiency and renewable energy in Uzbekistan

Title	Adoption date	Key features
On measures for the development of nuclear energy in the Republic of Uzbekistan	2018	State body “Uzatom” authorized for the development and implementation of a unified state policy and strategic directions in the development of nuclear energy was created
Strategy for the transition of the Republic of Uzbekistan to a green economy for the period 2019-2030	2019	Significant increase the economy’s need for resources while accelerated industrialization and population growth, as well as increase the negative anthropogenic impact on the environment and the growth of greenhouse gas emissions
On measures to radically improve the management system of the fuel and energy industry of the Republic of Uzbekistan	February 01, 2019	Ministry of energy was formed, which is entrusted with the function of an authorized body for the implementation of a unified state policy in the field of the use of renewable energy sources
On the use of renewable energy sources	May 21, 2019	Creation a legal and regulatory framework to accelerate the implementation of renewable energy projects
On public-private partnership	May 10, 2019	Procedure for connecting to the electric grids of the unified electric power system of business entities that produce electricity, including from renewable energy sources, and ensures non-discriminatory access of business entities to electric networks
Regulations for connecting to the unified electric power system of business entities producing electric energy, including renewable energy sources	July 22, 2019	The strategic goal is to provide the population and economy of Uzbekistan with electricity at competitive prices, the development of a balanced energy sector, covering the best world practices and current trends in the global electricity industry
The concept of providing the Republic of Uzbekistan with electric energy for 2020-2030	2020	Financial incentives for the purchase by the population and business entities of installations of renewable energy sources and comprehensive support for business entities involved in the production of solar and wind power plants, as well as small hydroelectric power plants
On additional measures to implement energy saving technologies and development of low-power renewable energy sources	September 09, 2022	

Source: Authoring

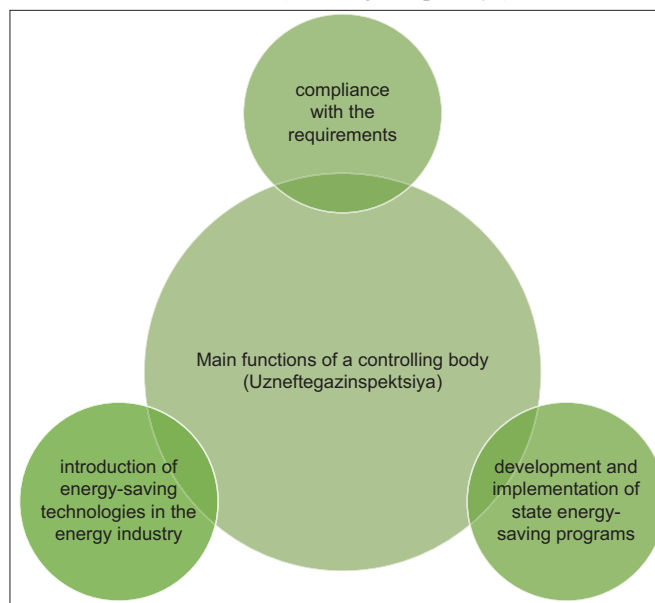
modern energy-efficient and energy-saving technologies in state bodies and organizations, as well as monitoring the efficiency of energy consumption.

The main controlling body is called Uzneftgazinspektsiya (Meaning: a controlling body over the use of oil products and gas under the Ministry of Energy of the Republic of Uzbekistan) and its main functions are demonstrated in the Figure 3.

The main tasks and functions of the Uzneftgazinspektsiya in the field of energy efficiency and resource conservation are as follows (Figure 3):

- Implementation of state control over compliance with the requirements of regulatory legal acts in sectors of the economy, from the processes of extraction of hydrocarbon fuels to the production of finished products, as well as the implementation of measures to reduce and ensure its rational use in sectors of the economy and the social sphere;
- Participation in the development and implementation of state energy-saving programs in the sectors of the economy, control over their implementation, assessment of energy efficiency, as well as coordination of work on energy audits and examinations of consumers of oil, gas, gas condensate and products of their processing;
- Introduction of energy-saving technologies in the energy industry, participation in the acceleration of processes to improve energy efficiency at enterprises and the provision of practical assistance within the powers of the inspection.
- Detailed analysis of the functions and goals of Uzneftgazinspektsiya shows clear focus on controlling, analysis of current trend worldwide and within the country as well as monitoring over efficiency of energy consumption. Alongside

Figure 3: Main functions of a controlling body over the use of oil products and gas under the Ministry of Energy of the Republic of Uzbekistan (Uzneftgazinspektsiya)



Source: (Controlling body over the use of oil products and gas under the Ministry of Energy of the Republic of Uzbekistan, 2023)

with that, there is no focus on rising public awareness.

Search through scientific literature revealed only a few research conducted in Uzbekistan with focus on social awareness on energy practices. Research conducted by (Eshchanov et al., 2021) showed that individuals who are older, own a car and live in a big family, have higher likelihood of being first adopter of RES, followed by individuals with a higher level of cognitive abilities

who experience power outages in the household. Consequently, researchers observe a positive relationship between an individual's level of cognitive abilities and environmentally friendly behavior using household-level data, estimated a positive association of cognitive abilities with public acceptance of RES. The second study (Eshchanov et al., 2013) investigates the decision-makers' perception on introduction of renewable energy sources in the residential sector of Uzbekistan using a survey-based analysis. They indicate three main drivers of renewable energy penetration: the possibility of becoming independent from the centrally supplied natural gas and electricity grid and availability of state funded financing, the higher price of energy from the renewable energy sources acts as a major disincentive. It is also revealed that the residents of urban type multi-storey houses have relatively very small opportunities for renewable energy application due to the smaller surface of their rooftops and also due to lack of sufficient surface in the neighborhood.

Such a limited amount of scientific research on public awareness in the field of RES and energy saving alongside with fast growing population of the country manifests the urgent need to examine people's perception of common energy saving practices. Undoubtedly, the transition towards energy efficiency and savings requires not only the restructuring of production chains, but also reformation of logistical, informational and managerial communications, as well as changing models of consumer behavior. The readiness of consumers for such a radical change in traditional patterns should be shaped gradually, with the transition from simple energy saving practices to more complex ones.

3. QUESTIONNAIRE DESIGN

Consumer demand for many types of goods and services is subject to formation. The shaping of consumer demand can occur both through active informational impact from the industrial sector (advertising), and through the construction of value orientations in the family and society. The modern system of school and university education in many countries of the world has a significant positive impact on the formation and promotion of various models of consumer behavior, the widespread introduction of which can have a significant impact on the environment. Despite the fact that the unpreparedness of technologies and infrastructure to provide such models of consumer behavior may hinder the introduction of pro-environmental models of consumer behavior, scientific literature in the field of sustainable development and green economies shows that it is cultural (values, traditions, etc.) and economic (price, taxes) barriers have the most significant impact on which of the practices of pro-environmental behavior are widespread and which are not (Kormos and Gifford, 2014; Lange and Dewitte, 2019; Lee et al., 2013).

Pro-environmental behavior (PEB) is a type of behavior aimed at minimizing the harm caused to the environment (Stern, 2000), as well as having a beneficial effect on it. PEB is divided into various categories, for example, personal and social (Chan, 2020; Dono et al., 2010), household waste management, resource saving, eco-consumption, transport use (Whitmarsh and O'Neill, 2010).

Transport and energy saving behavior is referred to as climate behavior aimed at reducing the carbon footprint, i.e. the amount of greenhouse gas emissions generated as a result of human activities (Whitmarsh et al., 2021; Nash et al., 2017).

The scientific literature contains an extensive database of studies of pro-environmental behavior and its determinants; there are various tools for measuring it. It was revealed that pro-environmental behavior is influenced by psychological, social, political, cultural, demographic and other factors (Schultz and Kaiser, 2012). Much attention is paid to the study of the role of values, norms, environmental attitudes and knowledge in the determination of pro-environmental behavior. Meta-analyses (Bamberg and Möser, 2007) descriptive and systematic reviews of the literature are being conducted to study pro-environmental behavior and its predictors (Sautkina et al., 2022).

In this research it was chosen to examine energy saving practices as a subcategory of pro-environmental behavior practices. The task is to study the popularity of various energy saving practices among the citizen of Uzbekistan. Among the factors influencing the popularity of a particular practice, we considered the age of the respondents, their economic activity and participation in the educational process.

The purpose of the developed questionnaire was to study and assess the readiness of consumers to change their daily practices. When conducting the study, two main questions were in the highest concern: (1) to what extent consumers are ready for the changes in their everyday patterns; (2) to what extent consumers are ready for more radical changes in behavioral patterns consistent with the concept of a green energy and economy.

The main hypothesis of the study was that energy efficiency practices actively promoted in Uzbekistan in recent years are reactive, not proactive, i.e., it is an attempt to reduce the rate of further environmental pollution and excess natural resources consumption due to the accumulation of production and consumption waste, but does not create prerequisites for a radical change in consumer behavior patterns.

In September-November 2022 a survey of a pilot group of 100 consumers was conducted, which included students from the Universities of Uzbekistan majoring in non-environment-related subjects, but their educational programs include courses in environmental management, business ethics, etc. On the one hand, such a choice of respondents is explained by the fact that this the category of consumers is the most informed and the most flexible in terms of patterns shaping of consumption belligerent behavior. On the other hand, Uzbekistan is the leader among the countries of Central Asia in terms of demographic growth, demonstrating an increase in the population for more than 5.4 million people since 2010. Currently, the population of Uzbekistan between the ages of 15 and 24 is about 5.54 million people. This particular age group will determine energy saving behavior among the population within the upcoming decades (Eurasian Research Institute, 2023).

Table 2: List of energy saving practices

Sequence number	Energy saving practice	Field of application
P1	Reducing the opening and closing frequency of the refrigerator door	Energy saving
P2	Setting the cooling/freezing temperature of the refrigerator properly	Energy saving
P3	Not overloading the refrigerator	Energy saving
P4	Cooling hot food before putting it in the refrigerator	Energy saving
P5	Setting the temperature of the air conditioner at 25°C	Energy saving
P6	Cleaning the air conditioner's filter	Energy saving
P7	Using energy-efficient light bulbs	Energy saving
P8	Turning off air conditioners when not in use	Energy saving
P9	Turning off lights when not in use	Energy saving
P10	Turning off TVs when not in use	Energy saving
P11	Unplugging appliances when not in use	Energy saving
P12	Using energy saving mode/turning off monitor when not in use	Energy saving
P13	Doing laundry collectively	Energy saving, water saving
P14	Adjusting the flame suitably when cooking	Energy saving
P15	Ironing collectively	Energy saving

Source: Authoring

Based on the analysis of scientific studies on the selected topic, a list of 15 main energy saving practices was formed that contribute to the formation of models and mechanisms of energy saving and energy efficiency, mainly through energy and resource conservation and energy saving (Table 2).

The first part of the questionnaire was designed to obtain socio-demographic data of the respondent. The questions of the second part of the questionnaire were aimed at determining the attitude of respondents to the issues of responsibility for the environment (overall level of environmental awareness) and assessing the frequency and reasons for the use (or not use) of energy saving practices. The answers were obtained through Google Forms in order to ease the result processing and involve more participants.

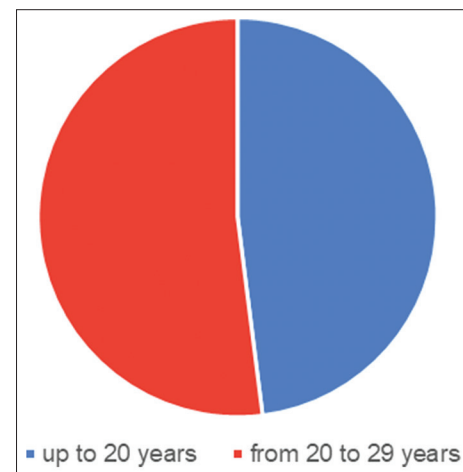
All respondents actively take part in the educational process. The distribution of respondents by age is shown in Figure 4.

Frequency distribution of the obtained answers is presented in Table 3.

The calculation of descriptive statistics on respondents' assessments of the frequency of using the proposed patterns of pro-environmental consumer behavior shows that the most popular practices include (calculated as total of "always and "often" options): P15 - Ironing collectively, P8 - Turning off the lights in empty rooms, P10 - Turning off the TV after watching, P4 - Cooling hot food before putting it in the refrigerator, P10 - Turning off TVs when not in use, P9 - Turning off lights when not in use (Figure 5).

The least popular practices are as follows (calculated as total of "rarely" and "never" options): P5 - Setting the temperature of the air conditioner at 25 C, P6 - Cleaning the air conditioner's filter, P2 - Setting the cooling/freezing temperature of the refrigerator properly, P3 - Not overloading the refrigerator, P11 - Unplugging appliances when not in use (Figure 6).

The analysis of the reasons indicated by respondents why they often use certain practice revealed that the most common reason

Figure 4: Distribution respondents by age

Source: Authoring

for using patterns P4, P8, P9, P10, P15 is the reason "habit", "money saving" and "rule".

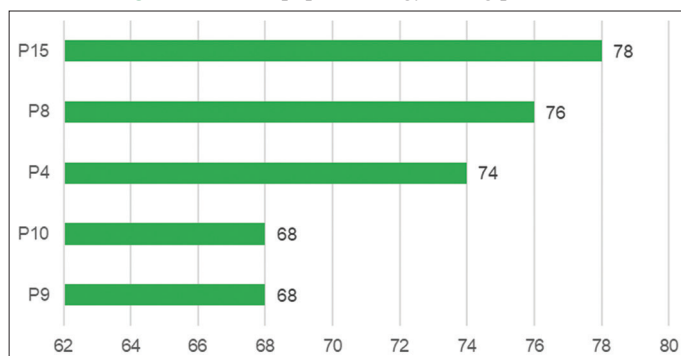
The analysis of the reasons for the rare use of unpopular practices showed that for practices P2, P3, P5, P6, P11 the most common reason for non-use is "time-consuming", "no rule" and "not necessary".

The results obtained during current study mostly correlates with the results of similar studies performed in other countries (Almastyan and Ratner, 2020; Ratner and Lazanyuk, 2020; Ratner et al., 2021; Phuphisith et al., 2020; Gomonoov et al., 2019). According to (Almastyan and Ratner, 2020) findings about behavioral practices in waste management in one of the regions of Russia the following reasons were indicated as the most common among the participants of the survey: "sense of duty, understanding of necessity," "utility (environmental attractiveness), "habit" and savings (financial benefit). These results are relevant to the ones obtained during ongoing research, showing that following pro-environmental practices (either energy saving or waste management) has similar background and underlying reason. (Ratner and Lazanyuk, 2020) analyzed practices related to circular economy adaptation among the consumers, they used non-parametric statistic methods to check correlation among various factors: among the factors influencing

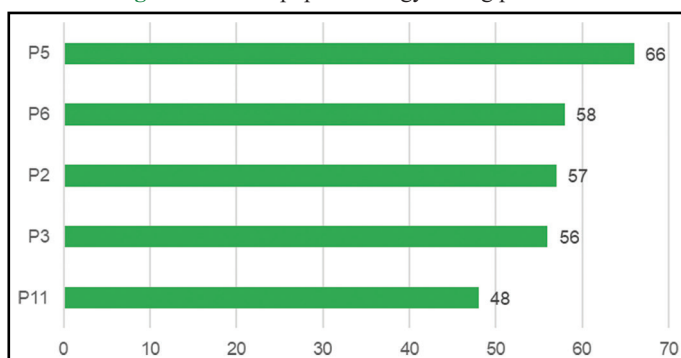
Table 3: Frequency distribution given by the respondents

Sequence number	Energy saving practice	Answers distribution (%)			
		Always	Often	Rarely	Never
P1	Reducing the opening and closing frequency of the refrigerator door	22	42	30	6
P2	Setting the cooling/freezing temperature of the refrigerator properly	18	25	27	30
P3	Not overloading the refrigerator	7	37	33	23
P4	Cooling hot food before putting it in the refrigerator	33	41	10	13
P5	Setting the temperature of the air conditioner at 25°C	19	15	32	34
P6	Cleaning the air conditioner's filter	25	17	25	33
P7	Using energy-efficient light bulbs	39	17	31	13
P8	Turning off air conditioners when not in use	64	12	17	7
P9	Turning off lights when not in use	59	9	9	23
P10	Turning off TVs when not in use	61	7	5	27
P11	Unplugging appliances when not in use	29	23	35	13
P12	Using energy saving mode/turning off monitor when not in use	33	28	15	24
P13	Doing laundry collectively	38	24	26	12
P14	Adjusting the flame suitably when cooking	41	37	7	15
P15	Ironing collectively	31	27	34	8

Source: Authoring

Figure 5: 5 most popular energy saving practices

Source: Authoring

Figure 6: 5 least popular energy saving practices

Source: Authoring

the popularity of a particular practice, they considered the age of the respondent, their economic activity and participation in the educational process.

4. CONCLUSION AND FUTURE DEVELOPMENT OF THE STUDY

The analysis of policy framework of Uzbekistan allowed to conclude that the main problems in the field of energy savings and energy efficiency in Uzbekistan is the excessive growth of

regulatory documents of different nature considering mostly technical and financial aspects of policies deployment. At the same time minor attention is paid to promote public awareness in the field of energy savings and efficiency among customers.

The analysis of conducted survey showed that the most popular energy saving practices in Uzbekistan are either those that are established everyday habits or those that can bring tangible financial benefits under current economic conditions. The main reasons for not using a number of patterns of consumer behavior is either a lack of understanding of their significance, or a complete lack of information about the possibility of such consumer behavior.

Further development of the conducted study implies extension of regions of the country covered by a survey, as well as including recipients of various age groups and level of education. Such extensions allow in-depth analysis of behavioral practices in connection with extended socio-demographic characteristics.

Another conclusion can be made upon the analysis of energy saving practices by young people in Uzbekistan. Ignoring the utilization of energy saving practices by young people indicates insufficient attention to environmental issues and sustainable development at school and within university educational programs. At the same time, the educational system has a huge potential for shaping energy saving practices not only in the process of direct learning, but also in the process of creating an appropriate educational environment.

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