«Uzbekistan with its immense renewable potential can meet the country’s all energy demand using only renewable sources of energy» – noted by energy specialists from Uzbekistan in a special article for the CABAR.asia.

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Being abundant in natural resources Uzbekistan has one of the biggest energy markets in Central Asia with its installed capacity of over 14.1 million kW, of which Thermo Power Plants constitute 85% of installed capacities[1]. Fossil fuels have been the primary energy resources; especially natural gas is utilized to supply the country with electricity. In addition to its abundance in natural resources, Uzbekistan is considered one of the richest countries in terms of renewable energy sources[2]. Uzbekistan has the potential to produce 50 billion t.o.e. based on solar energy, with current technology it would be possible to generate 175 million t.o.e, more than triple the amount of fossil fuel the country produces annually[3]. Moreover, the studied hydropower potential of Uzbekistan is estimated at 27.5 billion kWh per year. Currently, the country uses only about 39% of the technical hydropower potential. The wind and biomass potential of Uzbekistan exceeds 520,000 MW of installed capacity[4] and 6.3 milliard m3 of natural gas respectively[5]. Despite being energy self-sufficient, Uzbekistan’s ageing electricity infrastructure and network underinvestment have led to electricity shortages, inefficiency, high losses and low reliability. At the same time, growing domestic demand and demand for gas and oil exports have put pressure on the country requiring an urgent action to diversify the energy production and effective use of its renewable potential.
In spite of having such high renewable potential, Uzbekistan is moving sluggishly towards diversifying energy generation and lagging behind from its counterparts in the region. In comparison with other types of renewables, only hydropower can be said “developed” with almost 12% share in Uzbekistan’s total energy production. However, even this type of renewable energy source is only used 39% of the total estimated potential. While other types of renewable energy sources do not constitute even 1% of the total production. One may question that what are the obstacles that hinder the improvements in the renewables sector in Uzbekistan? This article tries to analyse the barriers to the development of renewable energy sector in Uzbekistan, possible solutions to eliminate these barriers and future directions of the renewable market based on the recent actions and plans of Uzbekistan.

**Reasons of lagging behind in renewables sector**

**Abundance in fossil fuels** - this may be one of the most primary reasons that hindered Uzbekistan to worry about the development of renewables sector. Uzbekistan’s proven reserves are estimated at about 1.8 trillion cubic meters (tcm) of gas, 0.6 billion barrels of oil, and 1.9 billion tons of coal. Most of the gas and oil reserves are located in the South-Western parts of the country. At current production rates, the proven reserves are estimated to last 31, 22 and 95 years respectively[^6]. The total undiscovered resources are estimated to be substantially larger. Over the years of independence, there have been observed a long run upward trending natural gas production and its export.
It can be concluded that some signs of Dutch disease were present in energy sector. High global market prices of natural gave has attracted Uzbekistan that country increased its natural gas production constantly over the years while at the expense of the development of renewable energy sources and diversification of energy generation. However, most of the revenue from the export of natural gas was spent on for the exploration and further increasing the extraction capacity of natural gas. While, R&D on renewables to promote the sector lacked the attention of the government.

Low electricity prices[71] - Uzbekistan is one of the countries that offer the cheapest electricity prices to its customers in comparison with other CIS countries. The electricity tariff has been low in absolute terms because of the low domestic cost of natural gas relative to international prices ($66 per 1,000 m3, which is substantially lower than its export price). Thus, Uzbekistan is losing millions of dollars of export revenue from selling natural gas. The real cost of production of one kWh of electricity is much higher than its price because of transmission and distribution losses that are almost 20% of the total production. In order to take control over the prices and keep them down the government heavily subsidizes its vertically integrated monopoly company Uzbekenergo. Therefore, any other source of energy cannot compete with state-subsidized low electricity prices and from private sector’s perspective investing in other sources of energy is not attractive. Thus, this has discouraged demand-side energy efficiency improvements.

Lack of legal framework for independent power producers - in Uzbekistan generation, transmission and distribution is under the control of the state owned monopoly Uzbekenergo. Because of the presence of state monopoly, lack of healthy competition and investment attractiveness in energy market of Uzbekistan local and foreign investors do not favor to invest in energy market. Every investor in the first place favors the clarity of the rules and wants their rights to be protected by the law. Unfortunately, there is no exact legal framework that protects the rights of the investor stating the requirements, conditions of connection to the grid, selling the energy produced by independent power producers. This is the very reason that makes the households hesitate whether to install the solar systems in their home or not. Local utilities may negotiate power purchase agreements on individual ad hoc basis, but this complicates the work of project developers to plan and finance projects on the basis of known and consistent rules.
Lack of financing options and qualified specialists[8] - consumers or projects developers may not have access to credit to buy or invest in renewables because of poor creditworthiness and immature capital markets. In rural areas of Uzbekistan micro credits for household scale renewable system may not exist or difficult to access because of bureaucracy. Because of uncertainty as to whether utilities will buy the electricity power project developers have difficulties in obtaining bank financing.

In Uzbekistan skilled personnel who can maintain, install operate and repair the renewable energy technologies may not exist in large numbers. Consumers, managers, engineers, architects, lenders, or planners may lack information about renewable energy technology benefits, geographical resources, operating experience, maintenance requirements, sources of finance, and installation services. The lack of skills and information may increase perceived uncertainties and block decisions.

Uzbekistan’s actions to improve the situation
Realising the current obstacles for the development of renewable sector in energy market and the need to diversify the generation of energy Uzbekistan has taken several actions that may mitigate and facilitate broad utilization of renewables.
In May 2018 Uzbekistan moved to negotiate with Russian Rosatom to design, build and operate a Nuclear power station the two block, 2.4 Giga-Watt VVER_1200 in Jizzakh region. The construction is intended to be completed in 2029 and may cost US $ 10 billion. On June 19, 2018 Uzbekistan established the Agency for Development of Nuclear Energy under Cabinet of Ministers. Upon the commencement of its operation, Nuclear power plant is expected to provide 15% of total energy generation.[9]

Moreover, on February 1, 2019 The President of Uzbekistan signed the decree and resolution on the establishment of a new Ministry of Energy[10]. These novelties aim to reform the country’s Oil & Gas and Power sectors. This is a firm step towards liberalization of the energy market. The newly established ministry will develop and implement single state policy in the Oil & Gas and Power industry aimed to ensure the country’s energy security. Moreover, it will implement state regulation of the production, transmission, distribution and consumption of electric and thermal energy and coal, as well as the extraction, processing, transportation, distribution, sale and use of Oil & Gas and their products.

As a continuation of recent energy sector reforms presidential decree on 27.03.2019 “On the strategy of development and further improvement of energy sector in the Republic of Uzbekistan”[11] the vertically integrated monopoly Uzbekenergo has been unbundled to Generation, Transmission and Distribution. This paves the road to privatize the energy market. Generation and Distribution can be privatized while keeping transmission under control.

**Development strategies**

Energy sector priorities to 2027 include increasing generating capacity, improving energy efficiency in the energy, transport and agriculture sectors, and using renewable energy sources more widely.

To expand the use of renewable energy sources, reduce energy intensity of production and
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- As part of the plan, the government plans to spend 314.1 billion UZS ($81 million) of its own money and raise 20.5 trillion UZS ($5.3 billion) from foreign sources to develop hydro, solar and wind power through 2025.

The government is hoping that efficient power use and conversion from fossil fuel to renewables will boost economic competitiveness, raise the standard of living and protect the environment.

- Hydro accounts for 12.7% of all Uzbekistani electricity now. Uzbekistan wants to raise it to 15.8% by 2025
- Uzbekistan will build 42 new hydro plants and modernise 32 more by 2021
- Solar and wind will account for 2.3% and 1.6% of the country’s power by 2025

Action Program on renewable energy development for 2017-2021 adopted on May 2017 to promote private sector investments in renewable energy development, serve as key indicators in this regard. Moreover, Presidential Decree on 23.10.2018 about measures of development providing financial stability of energy sector outlines the following reforms for 2019-2021[13]:

- Increase installed capacity of main TPPs and modernizing them;
- Improving metering infrastructure;
- Modernizing transmission lines of 7.1 thousand km;
- Increasing renewable energy share in production by attracting private sector via Public Private Partnership agreements.

The value of all reform projects that are intended to implement through 2019-2021 is almost $ 5bln. The primary sources of these projects are from Uzbekistan Reconstruction and Development Fund, Government budget and other international donors.

**Conclusion**

To conclude, Uzbekistan with its immense renewable potential can meet the country’s all energy demand using only renewable sources of energy. However, hitherto Uzbekistan cannot make use of its potential relying heavily on fossil fuels as a source of energy. This article has shed a light to main barriers that caused Uzbekistan to lag behind from its counterparts in terms of renewable sector developments. Hereafter, recently taken actions
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to improve the situation and future development plans and perspectives are presented. Uzbekistan has now realized that there is a need to urgent actions to eliminate the above mentioned barriers that hindering the renewables sector from development. It can be said that first steps are already taken by creating the regulator in the market (Ministry of Energy) and unbundling the energy sector into generation, transmission and distribution. Recent Presidential Decrees and Resolutions about Uzbekistan’s future plans on developing renewables sector can serve as a good hint for perspective investors and gives right direction by adding certainty into the market.

The recommendations for further developing the renewables sector and eliminating barriers can be:

- In the first place regulator should establish the legal framework stating all market rules and protecting the rights of independent power producers. This in turn, eliminates all market uncertainties;
- Instead of building large infrastructure projects from the government budget, Public Private Partnership agreements can be used to attract foreign investors;
- To decrease initial cost of the technology, the government should pay more attention to produce technologies within the country, as Uzbekistan owns all necessary components of renewable technologies;
- To make the project further attractive regulator should establish incentive programs for both households (feed-in tariffs, net metering, rebates) and large scale power producers (tax incentives, Renewable Energy Credits);
- To increase the qualification of the specialists in cooperation with international organizations (International Energy Agency, World Bank, Asian Development Bank) can be organized several technical assistance, trainings and master classes from highly skilled specialists.

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