Research Renewable Options

Renewable Energy in Azerbaijan at a Glance

Azerbaijan is one of the countries with high potential for renewable energy sources. Thus, the potential of renewable energy sources, which are economically viable and technically feasible, is estimated at 26 940 MW, including 3 000 MW of wind energy, 23 040 MW of solar energy, 380 MW of bioenergy potential, 520 MW of mountain rivers.

Although it is rich in energy resources and recognized as an energy exporter in the world, the use of renewable energy sources are paid special attention in the Republic of Azerbaijan. One of the main goals of the energy security policy implemented under the leadership of the President of the Republic of Azerbaijan Mr. Ilham Aliyev is to strengthen the use of renewable energy sources in the country.

One of the main steps taken for the efficient use of renewable energy potential in our country was the adoption of the "State Program on Use of Alternative and Renewable Energy Sources in the Republic of Azerbaijan" in 2004. The adoption of the program has created opportunities for the implementation of radical changes in the use of renewable energy sources and the assessment of our potential in this area.

The decisions adopted by the country's leadership in this field since 2009. It was repeatedly stressed that the legislative acts adopted by the country's leadership play a major role in increasing the production of alternative and renewable energy in the expansion of national energy security.

Azerbaijan Renewable Energy Agency under the Ministry of Energy of the Republic of Azerbaijan was established by the Decree No. 1159 of the President of the Republic of Azerbaijan dated September 22, 2020 and the Charter of the Agency was approved.

The paragraph 5 (CLEAN ENVIRONMENT AND GREEN GROWTH COUNTRY) of the document "Azerbaijan 2030: National Priorities for Socio-economic Development" approved by the Order of the President of Azerbaijan Republic dated 2 February 2021 covers the issues of climate change and the fight against it, as well as the application of renewable energy in all sectors of the economy based on the principles of green energy in our country. This national priority can be regarded as a clear example of our focus on the renewable energy sector and the green economy.

Currently, the project "Support to Renewable Energy Auctions in Azerbaijan" is being implemented with European Bank for Reconstruction and Development (EBRD). Within the framework of the project, auction rules, a set of conditions for auctions, sales and purchase agreements will be developed.

In order to study the potential of wind energy in the Caspian Sea and coastal areas, the Ministry of Energy cooperates with the International Finance Corporation, which is part of the World Bank Group, to develop the "Road map for the development of offshore wind energy use in Azerbaijan". It was noted that the process of preparing the "Road map on the development of the use of offshore wind industry in Azerbaijan" will cover such issues as geospatial mapping and zoning, economic analysis, financial analysis, environmental and social analysis, impacts assessment, permitting, consenting, regulatory and legal framework, transmission upgrades and supply chain analysis.

Cooperation with international companies is expanding in order to strengthen cooperation in the field of using renewable energy sources and to promote investment in this sector in the future.

Commission was established to coordinate implementation of pilot projects on construction of wind and solar power plants in Azerbaijan pursuant to the Order №1673 dated 5 December 2019 by the President of the Republic of Azerbaijan on "Actions for implementing pilot projects on the use of renewable energy sources".

Along with the projects decided to be implemented, negotiations on cooperation with other investment companies are continuing. At the same time, measures are being taking with relevant agencies on the study of land ownership and assignment, environmental impact assessment of renewable energy sources projects, exploration and development of infrastructure availability on fields, as well as the measurement of

Within the pilot project "Knowledge Exchange and Technical Assistance on the Development of Floating Solar Panels System" implemented with the support of Asian Development Bank, the

installation of a photovoltaic system with a capacity of up to 100 kW on Boyukshor Lake, as well as the development of business models to encourage the participation of the private sector in the installation of solar panels, strengthening national capacity through trainings are envisaged. The implementation of the project is planned to be completed by March 2023.

In December 2020, the Ministry of Energy proposed to establish a working group on "Energy issues" in the inter-departmental Center and the concept of "Green energy zone" in order to ensure the necessary coordination in the energy supply issues of the liberated territories. At present, the Working Group has been established by the Ministry and the work on the preparation of the relevant concept document has been started.

On February 22, 2021, the Ministry of Energy of the Republic of Azerbaijan and BP signed a memorandum of understanding on cooperation in assessing the potential and conditions required for large-scale de-carbonized and integrated energy and transport systems, including renewable energy projects in the regions and cities of Azerbaijan. The Master Plan of this project will cover clean energy projects, low-carbon transport, green buildings, waste management, clean industry, natural climate solutions, integrated partnerships, as well as the development of integrated and de-carbonized energy and transport systems.

Assessment of the potential of renewable energy sources in Karabakh and surrounding regions has begun. In 6 districts (Fuzuli, Jabrayil, Zangilan, Gubadli, Lachin and Kalbajar) on the liberated territories, 8 perspective areas were determined,

Given that about 25% of Azerbaijan's local water resources are formed in Karabakh, the prospects of using large rivers such as the Tartar, Bazarchay, Hakari and their tributaries for electricity generation are considered by the employees of the Ministry of Energy and Renewable Energy Agency, and information was collected about the existing SHPPs in the region.

Khazar University Renewable Orientation

Khazar University researchers are working on both sides of the sustainable energy problem: designing technologies to harness renewable sources and studying the integration of these devices into existing and future energy systems. At Khazar University, researchers use simulation, optimization and experimentation to conceive and validate new designs. They also work with industrial partners to test full-scale prototype devices. The goal is to make these devices viable alternatives to fossil energy generators by improving both technical performance and cost effectiveness.

The renewable energy group focusses on:

Resource characterization

Effective use of renewable energy technologies requires a good understanding of resource availability. Temporal and spatial characteristics of waves, tides, and wind are being quantified to provide data for further analysis and project development.

Wind power

A rapid evolution in wind turbine technology has reduced costs, increased performance, and enabled global development of wind power. Research continues to address challenges with cold climates, component fatigue, and installation hurdles that come with increased scale. New technologies are being examined which mitigate issues with land-use and resource dynamics.

Wave and tidal systems

Land-use is a constraint that can limit the feasible options for energy supply and generation. Waves and tides are renewable energy sources with potential to generate electricity for coastal communities. New technologies that capture and transform natural fluxes are being developed and assessed.

Solar systems

Solar energy is seeing broad uptake due to significant cost reductions and desirable environmental attributes at scales that allow for distributed deployment with storage. In addition, solar thermal systems can provide heat for comfort and hot water. The value of solar technologies is being quantified over a range of scales in regions of Azerbaijan

Solar Energy Education

Solar power is clean green electricity that derives from sunlight or from heat from the sun. Having solar electricity in your home usually means setting up a solar photovoltaic system on your roof.

Solar energy is a renewable free source of energy that is sustainable and totally inexhaustible, unlike fossil fuels which are finite. It is also a non-polluting source of energy and it does not emit any greenhouse gases when producing electricity. The solar electricity that is produced can supply your entire or partial energy consumption.

A solar panel, while rugged and durable in its finished form, requires a complex and very technical process in its production.

The three specific research development problems will be addressed to the following issues:

1. A study of how wind power and solar irradiance in Azerbaijan will change in the future (due to anthropogenic- human caused - change and natural variability), and to what degree future variations in these two resources might complement each other.
2. Further developing the Regional Climate Model (RCM) for high-latitude applications. While the RCM provides the best tool we have for predictions of future climes in Azerbaijan, relatively little work has been done so far in determining how well it simulates near-surface processes in this environment.
3. An extension of the engineering/economic analysis for the present climate at a subset of community sites, considering different energy system model formulations and different renewable energy systems (e.g., airborne wind energy), and extending the analysis to assess possible risks associated with climate change.

All predictions of future climates (and associated renewable energy resources) are uncertain. Some uncertainties, associated with observational gaps and model biases, can be reduced with continued research. Others, such as those associated with natural internal variability of the climate system, cannot be reduced and therefore must be quantified. The future research will improve modelling capacity (both environmental and energy systems) in Azerbaijan through systematic analysis of the models and collection of new and valuable data. Through analysis of natural variability of wind and solar power resources, it will also quantify the range of possible renewable energy futures in this region.