THE ROLE OF AZERBAIJAN IN GREEN ENERGY TRANSITION

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Abstract

The importance of energy for the continuity of global order and progress is irrefutable. Energy, which is an important factor in life, undoubtedly has a critical role in the development of countries. However, recent events have shown the urgent need to change how we source energy. Climate change and its negative consequences are forcing nations to take precautions against its devastating effects. In response, countries, both individually and collaboratively, have begun to frame their energy strategies in line with the green energy concept. As one of the countries taking responsibility, Azerbaijan has assumed a leading regional role. The Azerbaijani government has outlined actions to mitigate CO_2 emissions through both a national climate change strategy and a low-carbon development plan. This study explains the reasons behind and the expected outcomes of countries transitioning to low-carbon economies by using green energy sources instead of fossil fuels. It also highlights Azerbaijan's role in this transition toward sustainable energy efficiency.

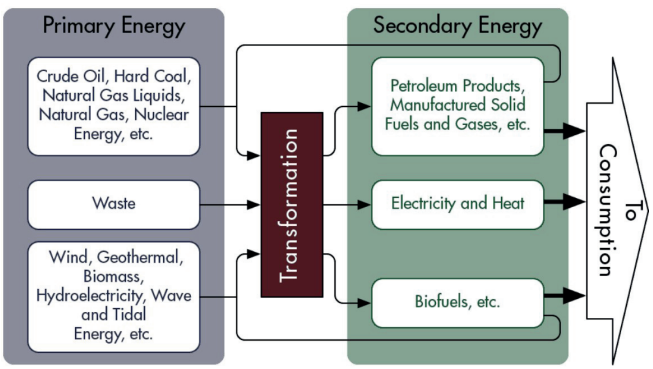
Keywords: Climate change, energy efficiency, sustainable development, carbon economies

1. Introduction

Energy is an important factor in meeting people's daily needs and contributing to the welfare of countries. Energy sources are divided into two main categories. It is possible to categorize them as Primary (Traditional) and Secondary (Alternative) Energy Sources. Traditional energy can be expressed as natural gas, coal or crude oil and its products."[1]

Energy produced from primary or secondary intermediate sources is referred to as alternative energy.

Table 1. Traditional and Alternative Energy Sources



Source: Stem. Guide (2024). "Primary Resources and Secondary Energy" (https://stem.guide/topic/primary-resources-and-secondary-energy/)

The list of publications can be downloaded on the following website: https://www.ijhsdr.com/

Modern energy development worldwide aims to ensure accessibility. Due to various reasons, traditional energy sources often fall short of achieving this objective. Consequently, the significance of alternative energy is on the rise. It encompasses promising approaches for producing energy from renewable sources, which, while not as prevalent as traditional sources, are appealing due to their low environmental impact[2].

Traditional or Alternative, these resources are not distributed equally on the country basis. Some countries are categorized as "rich" in hydro-carbon energy sources while some others are "rich" in renewable energy resources. Today, primary energy still has the highest rates recorded to produce the energy that we need in our daily lives and in industrial productions. Recently, more than %60 of global electricity is produced via fossil fuels. Additionally, the need for energy has been increasing each year. According to International Energy Administration (IEA), the energy need will grow by %50 until 2050. The agency stated that robust economic expansion, particularly in developing Asian economies, will lead to worldwide growth in energy usage, even in the face of pandemic-related decreases and ongoing enhancements in energy efficiency.[3]

Nevertheless, the world is currently headed for a dangerous 3°C warming. While the planet grapples with the negative effects of the climate change (species loss, ocean changes, rising sea levels, droughts and floods, heat waves...) the shift away from the fossil fuels to renewable energy has never been more urgent. Therefore, to meet the rising demand, fossil energy must be replaced by equal amount of green energy which is obviously difficult to manage but obligatory.

The adoption of green energy is vital for several reasons:[4]

1. The use of wind, solar and hydroelectric energy minimizes the release of greenhouse gases, which aids combat climate change by reducing water pollution as well as air pollution.

2. Renewable energy sources are plentiful and naturally replenished, unlike finite fossil fuels that can lead to environmental degradation during extraction and use.

3. Investment in local renewable energy sources decreases dependence on imported fuels, which can be influenced by geopolitical tensions and price fluctuations, thus enhancing energy security.

4. The rapidly expanding green energy sector generates employment opportunities in manufacturing, installation, and maintenance, promoting economic growth and innovation.

5. Reduced air pollution from the combustion of fossil fuels leads to improved public health outcomes, resulting in lower healthcare costs and a better quality of life.

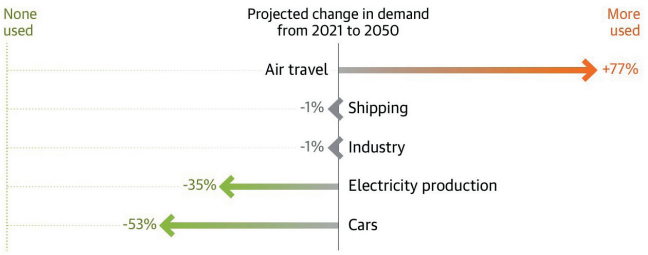
6. The transition to green energy has driven technological innovation, leading to more effective energy solutions and creating opportunities for advancement across various fields.

7. Adopting green energy use can facilitate communities' adaptation to climate change outcomes by promoting sustainable methods and building resilient infrastructures.

Overall, the significance of transitioning to green energy lies in its potential to create a more sustainable, economically viable, and healthier future for future generations.

However, although some important steps have been taken to limit fossil fuel consumption, such as the growth of the electric vehicle market and the reduction of coal-based production, reaching the target of zero CO2 emissions by 2050 is still a long way off.

Graphic 1. Global Fossil Fuel Demand



Source: Rhodium Group "Analysis of Global Fossil Fuel Demand". (https://www.theguardian.com/environment/2024/feb/09/biggest-fossil-fuel-emissions-shipping-plane-manufacturing)

The reason of the continuing carbon pollution derives from three main areas: aviation, shipping and industry. Apparently, there is not an alternative to jet fuel or ship diesel yet. Additionally, it would seem some industries such as cement-making and plastic will prevent a meaningful cut in carbon-intensive fuels till 2050. Still, the world needs to face to the fact that green energy is no longer a choice it is an obligation. More greenhouse emissions will cause more extreme reflections in line with climate change and its widespread terrifying effects will be experienced across the world. The severity of impacts from climate change will depend on the direction of future human activities. Executive Director of International Energy Agency Fatih Birol underlined the importance of getting prepared for this transition, stating, "We are observing the initiation of the fossil fuel era's conclusion and must ready ourselves for the forthcoming epoch." He also mentioned that substantial investments in new fossil fuel projects carry serious climate and financial risks.[5]

When we consider the developments regarding the transition to green energy, we see that some important voluntary steps have been taken to reduce greenhouse gas emissions after the 2015 Paris Agreement. For example, the European Union's target of reducing emissions by at least 55% compared to 1990s levels and the US's commitment to a 50-52% reduction by 2030 compared to 2005 levels are examples of global methane gas emission reduction efforts[6]. In addition, Azerbaijan, one of the world's leading energy producers and exporters, plays a critical role in the green energy transition by cooperating with European markets. Azerbaijan aims to reduce greenhouse gas emissions by 2030 and increase energy security by expanding the use of renewable energy sources. To this end, the country has developed an Offshore Wind Energy Roadmap in cooperation with the World Bank and the International Finance Corporation (IFC). Azerbaijan, despite being a top producer of gas and oil globally, is seeking to transform into a hub for renewable energy in the region, with the assistance of its international allies. By 2030, Baku is aiming for 30% of Azerbaijan's domestic electricity to be generated from renewable sources. The main goals of this initiative include diversifying government revenue streams, improving clean and sustainable electricity production, and decreasing greenhouse gas emissions. To accomplish these goals, Baku has entered into agreements with foreign partners,

including BP, Masdar in the UAE, ACWA Power in Saudi Arabia, and Fortescue in Australia. Consequently, significant contributions from abroad have been made to the development of renewable energy infrastructure in Azerbaijan.[7]

2. Importance of the Green Energy

Green energy can be described as the energy obtained from sun light, wind, rain, plants, algae and geothermal heat sources. These energy sources are naturally renewable, and with a well-planned production, the system could renew itself. Renewable energy is also called as "sustainable" energy.[8] On the contrary, fossil fuels need millions of years to exist, and they are described as "limited" sources which will end up in time because of excessive use.

The phrases green energy and renewable energy are commonly used interchangeably, but there is a crucial and sometimes perplexing distinction between them[9]. While most green energy sources are renewable, not all renewable energy sources are considered entirely green. Clean energy refers to energy that does not pollute the atmosphere and these energy sources will not release any greenhouse gases into the atmosphere. Once again, there are clear overlaps between clean energy, green energy, and renewable energy. Here is a simple method to distinguish between them:[8]

- Clean energy = unpolluted air
- Green energy = derived from natural sources
- Renewable energy = sources that can be recycled

Compared to fossil fuels, green energy sources have much less negative effects on the environment. To be able to reach fossil fuels, it is needed to apply mining and drilling methods on ecologically sensitive areas. Burning fossil fuels has been the primary source of energy for over a hundred years, supplying the power needed for transportation, businesses, and household lighting. Currently, approximately 80 percent of the energy demands are met by oil, coal, and gas, as reported by the U.S. Energy Information Administration. The use of fossil fuels for energy has resulted in significant consequences for humanity and the environment, including air and water pollution as well as global warming. Additionally, there are numerous adverse effects associated with petroleum-based products such as plastics and chemicals.[10] However, green energy is easy to find and available even in faraway places that don't have access to electricity.

Even though (because it is in its infancy) green energy seems more expensive than traditional resources, by the help of technology, the costs of solar panels, wind tribunes and other green sources would decrease. The future potential of green energy to replace fossil fuels may necessitate diverse production methods. For instance, geothermal energy is highly effective in areas where it is readily accessible, while wind and solar power may be more suitable in different geographic locations. By combining various green energy sources and leveraging advancements in their production and development, there is a strong possibility of phasing out fossil fuels.[11] It also gives a chance to everyone, not only to big companies that produce oil, gas or coal, to produce their electricity by themselves.

But although it is easier to access to renewable energy sources there is a very important problem that forces countries and companies to move on with fossil fuels: Fossil fuels are easy to store but we cannot say the same for the Renewables. Recently, some projects have been introduced to improve storage technologies, but they are not efficient enough especially in large scale areas. Still, the main answer to the question "why green energy" is obvious, because it never pollutes the environment. If we want the humanity to survive, then there is no other way than transition to Green Energy. Although fossil fuels are cheaper, easier to store or ship but they pollute our planet and cause global warming which will have devastating effects on environment.

Today, transition from fossil fuels to green energy resources is in the center of many countries especially the developed countries which demand energy more than others. In addition to environmental problems, fossil fuels are also used as a political weapon when there occurs a crisis between countries as we have witnessed in the war between Russia and Ukraine started in 2022. The war increased tensions between Russia and the West. This political crisis brought about many sanctions against Russia, which caused an energy crisis, especially in the European Union, which was heavily dependent on Russian gas.

The ongoing war between Russia and Ukraine has prompted the EU to take new measures to break Moscow's monopoly on energy imports. Russia, which does not hesitate to use its energy card for political purposes, has prompted the search for new measures and resources to counter it. Germany has reduced its dependency on Russian gas from 55% to 35% (BBC, 2022). In addition to the individual measures taken by countries, the EU has also made collective decisions. On March 8, 2022, the EU published the "REPowerEU: Joint European Action for Affordable, Secure and Sustainable Energy" plan, which aims to free the EU from its dependency on Russian gas by 2030 (European Commission, 2022). The plan includes topics such as renewable energy, diversification of fossil fuel use, and energy savings. As a result, the EU began to develop projects aimed at reducing energy dependency on Russia and securing and diversifying energy resources. In this process, Azerbaijan in the Caucasus and the Central Asian countries played an important role as diversification and transit points in providing energy to Europe.[12]

More than fifteen years EU has been evaluating the measures to green energy. In 2019, EU members launched the European Green Deal, in line with the commitments of the Paris Agreement, to combat global warming and accelerate the clean energy transition. The European Commission approved a set of proposals to align the EU's climate, energy, transport and tax policies to reduce net greenhouse gas emissions by at least 55% by 2030, compared with 1990 levels.The economy's key sectors are subject to legally binding climate targets within the EU. The comprehensive plan encompasses reduction targets for emissions in various sectors, an objective to enhance natural carbon absorption, a revised emissions trading system to limit emissions, impose a pollution charge, and stimulate investments in the transition to green practices, as well as assistance for citizens and small enterprises. Member States are now required to dedicate 100% of their emissions trading revenues to climate and energy-related initiatives and the social aspect of the transition.13 The newly established Social Climate Fund will allocate €65 billion from the EU budget, and a total of over €86 billion, to provide support for the most vulnerable citizens and small

businesses during the green transition. This commitment aims to create opportunities for all individuals by addressing inequality and energy poverty, and by enhancing the competitiveness of European companies, ensuring that no one is left behind.[14]

Important developments have been observed in terms of Renewable Energy transition in EU. In the initial six months of 2024, renewable sources accounted for 50% of the EU's electricity production. Surpassing gas, wind power became the EU's second leading electricity source after nuclear energy. From 1990 to 2022, the EU's greenhouse gas emissions decreased by 32.5%, while the EU economy expanded by approximately 67% during the same time frame.[13]

Even though the need for fossil fuels to generate the energy hasn't replaced completely by the Green Energy Resources yet, it is still the most important item in countries' agenda. Countries' ability to switch to green energy is related to their capacity of technology. Because even though it is significant to take precautions to protect the environment it is equally needed to find finance to support any project for green energy transition. Renewable energy means higher costs compared to traditional energy resources which triggers the concerns about how to motivate people and countries to prefer it. At that point, motivation and encouragement relates to three main positive motives of green energy. These are ecological benefits, the rise in countries' economical levels and social pressure.

3. Azerbaijan's role in Green Energy

Having a huge renewable energy potential, Azerbaijan has been a good example of successfully transition to alternative energy. Although the country's development and progress in economy is still strongly linked to oil and gas production, Azerbaijan intends to become an effective regional actor in applying the innovative approaches for green energy transition.

The Republic of Azerbaijan has implemented a State Program to promote the use of alternative and renewable energy sources on 21 October 2004, by Presidential Decree No. 462. This important program is considered a strategic addition to the country's energy policy. The main purpose of the program is to support energy production from environmentally friendly renewable energy sources and to ensure more efficient use of hydrocarbon-based resources. The State Program sets goals such as revealing the potential of renewable energy sources, increasing the country's energy efficiency by developing these sources, creating new energy production areas and providing job opportunities, and strengthening national energy security by supporting existing energy capacity with renewable resources.[15]

The Memorandum of Understanding signed between the EU and Azerbaijan in 2006 set important goals in the energy sector. These goals include modernizing the electricity grid, making the energy infrastructure safer and more reliable, creating new programs and regulations for renewable energy sources, and increasing energy efficiency. These goals are in line with the State Program implemented by the Ministry of Industry and Energy of Azerbaijan. SAARES was established within the framework of this program in 2009. In December 2011, a new government strategy aimed at achieving the 20/20/20 climate and energy targets set by the EU in 2006 was approved for the period 2012-2020. This strategy focuses on the development of alternative and renewable energy sources.[16]

The country aims to reduce greenhouse gas emissions by approximately 40% by 2050. It aims to increase its use of renewable energy to 30% by 2030. It also aims to expand and diversify its existing energy infrastructure to become a pioneer in the field of green energy. To follow through its ambitions in renewables Azerbaijan aims at developing projects with important companies such as ACWA Power (Saudi Arabia) and Masdar (United Arab Emirates). Within the frame of alternative energy transition, the government plans to implement a project to instruct a power plant in Yashma and make Nachchivan to become a green energy zone together with Karabakh and Zanzegur.

Azerbaijan is implementing the country's largest renewable energy project to date. In this context, three new facilities are being built, two solar and one wind power plant, to meet Baku's goal of providing 30% of its energy production from renewable sources by 2030. The projects are managed by a consortium formed by UAE-based Masdar renewable energy company and Azerbaijan's state oil company Socar. The capacities of the facilities are planned to be 445 Megawatts of solar energy in Bilasuvar. Also, 315 Megawatts of solar energy in Neftchala and 240 Megawatts of wind energy in the Absheron-Garadagh region, respectively.[15]

Considered one of the countries in the sunny countries category, Azerbaijan has significant potential for solar energy production. It receives up to 3,200 sun hours per year. Solar intensity can reach up to 2,000 kWh/m2.17 In October 2023, the 230 MW Garadagh Solar PV Plant was inaugurated. Additionally, several other projects are underway with the agreements planned to be signed with stakeholders. While expanding its solar infrastructure the country collaborates with private and public partners in the sector.

Although it has a great potential in solar energy generation, much attention has been paid to wind power electricity production. Azerbaijan has a great potential to generate wind power. According to the Ministry of Energy, the country has a technical potential of about 3,000 MW and an economic potential of 800 MW of wind energy. This economic potential can generate about 2.4 TWh of energy, which means saving about 1 million tons of conventional fuel, which indicates a significant reduction in CO2 emissions (International Energy Agency). Hydropower has been the primary renewable energy source in Azerbaijan for over a century. The first hydroelectric power plant, established in 1883 in the Galakend village of the Gedebey district, aimed to provide electricity to both the local population and the surrounding industrial facilities. With the arrival of the 1950s, the Varvara and Mingachevir hydroelectric power plants increased their production capacities and made significant contributions to the development of the sector. Hydroelectric energy accounts for approximately ten percent of the country's total annual electricity production. While approximately twenty-five percent of freshwater resources are located in the Karabakh and Zangezur regions, the Mingachevir Hydroelectric Power Plant constitutes the largest hydroelectric infrastructure in the region with a capacity of 424 MW.

With the support of the European Bank for Reconstruction and Development (EBRD), Azerbaijan began exploring low carbon hydrogen production in February 2023. Azerbaijan is committed to realizing its ambitious goal of establishing a thriving green hydrogen industry. By entering into partnership agreements with

international private sector entities, Azerbaijan aims to facilitate the creation of approximately 10 GW of renewable energy soon, which will play a significant role in hydrogen production.[18]

Azerbaijan's rise to a leading position internationally, thanks to the government's transition to green energy and climate protection efforts, led to the 29th meeting of the Conference of the Parties to the UN Framework Convention on Climate Change (COP 29) being held at Baku. COP29 Presidency's plan is based on enhancing ambition to ensure all parties commit to ambitious national plans and enhance transparency. The plan's second key point is to "enable action" which reflects the critical role of finance, a key to put ambition into action because to reduce the emissions and loss and damage caused by the climate change finance has a big part[19].

3.1. Azerbaijan's Major Solar Projects

By 2050, Azerbaijan plans to significantly expand its hydropower capacity as part of its renewable energy strategy. Key projects and goals include:

a. Masdar Solar Plant: In October 2023, the plant began its commercial operation. Annually, the project produces 500 million kilowatt-hours of electricity, sufficient to fulfill the requirements of over 110,000 households, and it will decrease emissions by 200,000 tonnes per year. Furthermore, the solar power plant has generated employment opportunities for the local community.[20]

b. Nakhchivan Solar Power Plant: Nobel Energy, a subsidiary of NEQSOL Holding, has signed an agreement with the Ministry of Energy of Azerbaijan to build a 400 megawatt (MW) solar power plant in the Nakhchivan region of Azerbaijan.[21]

c. The Gobustan Hybrid Power Plant (HPP): integrates wind, solar, and biogas power generation, transmitting electricity to the grid in a hybrid form. The Gobustan HPP aims to explore options for self-sustained energy supply to villages and districts using power generated at the station. Initially, the focus is on meeting the energy demands of Gobustan city, with plans to extend to the Gobustan region. Spanning 38 hectares, the station is situated in Gobustan city of Gobustan region. The station's project capacity is 6.4 MW, with the first stage of construction completing in 2013, adding 3.6 MW of power. Since commissioning, the station has generated 36.3 million kWh of electricity up to January 1, 2022.[22]

e. Garadagh Solar Plants: The Garadagh Solar PV Power Plant, with a capacity of 230 MW, was opened on October 26, 2023, with significant participation from Azerbaijan and the UAE. Azerbaijani President Ilham Aliyev and UAE Minister Sultan Ahmed Al Jaber also attended the opening ceremony. This facility is the largest solar power plant in the Caspian region and the CIS countries and was established with foreign capital worth 262 million US dollars. It is also the first large-scale solar power plant to be implemented in the country with foreign investments. The plant is expected to produce 500 million kilowatt-hours of electricity annually, save 110 million cubic meters of natural gas and reduce 200 thousand tons of carbon emissions. The plant, which is located on a large area of 550 hectares, houses 570 thousand solar panels. It is integrated into the grid with a 330-kilovolt transformer substation.[23]

3.2. Azerbaijan's Major Wind Power Projects

a. Khizi-Absheron Wind Energy Project: It is an onshore wind power project with a capacity of 240.5MW, scheduled to be in Absheron, Azerbaijan. According to GlobalData, a company that monitors and profiles more than 170,000 power plants globally, the project is currently in the construction phase and will be executed in several stages. Construction of the project is anticipated to start in 2022, with commercial operation expected to commence in 2025.[24]

b. Azerbaijan's Offshore Wind Energy (Caspian Sea): Azerbaijan, in partnership with the World Bank and the International Finance Corporation (IFC), has announced its Offshore Wind Roadmap for 2022. The roadmap highlights the country's potential to reach 7 GW of offshore wind capacity by 2040, given appropriate strategies, infrastructure development, investments and policies. The roadmap details steps to maximize the potential of offshore wind energy. Recommendations include setting targets for 2030 and 2036, implementing a 200 MW pilot project and launching a competitive bidding process ahead of large-scale projects, further examining potential offshore wind regions, modernizing infrastructure, adopting global best practices for funding, and providing all government departments and the future workforce with the necessary expertise and skills.[25]

3.3. Azerbaijan's Major Hydropower Projects

Azerbaijan's hydropower contributes approximately 10% to the country's annual electricity production. The Karabakh and East Zangazur regions hold around 25% of the nation's freshwater reserves, emphasizing the importance of hydropower in meeting the 2050 Net Zero goal within these specified Green Energy Zones. With an installed capacity of 424 MW, Mingachevir Hydroelectric Power Plant stands out as one of the leading examples of Azerbaijan's hydroelectric infrastructure.[26]

Azerenergy OJSC has committed to investing more than 40.5 million manats (equivalent to over $23.8 million) in the refurbishment of three small hydropower plants and the incorporation of six additional plants into the energy grid in Azerbaijan's Karabakh and Eastern Zangezur regions. The Public Procurement web portal reported that AzerEnerji has entered a contract with Azconstruction CJSC, the successful bidder of the relevant tender, to undertake the reconstruction and integration projects.[27]

4. Azerbaijan's Partnership with Georgia, Romania and Hungary for Green Energy

Transelectrica, the transmission system operator in Romania, along with Georgian State Electrosystem, the transmission system operator in Georgia, AzerEnerji, the power utility in Azerbaijan, and MVM, the power utility in Hungary, have come together to form a collaborative company with the purpose of laying a submarine cable beneath the Black Sea.[28]

The plan is to extend a cable connecting Romania and Georgia to include Hungary and Azerbaijan. This extension aims to create a link between the transmission networks of the four countries and make it easier for renewable electricity to be transmitted. The first results of the feasibility study are set to be presented at

COP29 in Baku. It is aimed to contribute to the decarbonization of energy sector by transporting renewable energy via this project. At a meeting held in Brussels on April 5, 2024, representatives of the EU, the US and Armenia came together. At this meeting, EU Commission President Ursula von der Leyen announced that they will invest in new infrastructure projects. In particular, she said, "We will invest in a new electricity transmission line that will pass through the Black Sea. This line has the potential to provide clean and renewable energy to Europe and we are ready to support this project."[29]

5. Azerbaijan's Partnership with Kazakhstan and Uzbekistan for Green Energy

A joint venture is set to be formed by Azerbaijan, Kazakhstan, and Uzbekistan for the purpose of exporting green energy to Europe. "The Energy and Economy Ministers of Azerbaijan, Uzbekistan and Kazakhstan came together at a meeting held in Baku. At this meeting, the possibilities of Central Asian countries exporting electricity to Europe via Azerbaijan were discussed and it was stated that a mutual agreement was reached on this issue.[29]

After the meeting, a collective statement was issued by the ministry leaders acknowledging the renewable energy capabilities of regional countries and their willingness to participate in the initiative for supplying electricity to Europe from sustainable sources.

As per the statement, the participants will establish a collaborative task force to brainstorm on energy exchange cooperation, emphasizing renewable energy sources, the generation and shipment of eco-friendly ammonia and hydrogen, and the development of relevant infrastructure.

Uzbekistan aims to generate 20 gigawatts (GW) of additional capacity from renewable energy sources by 2030. Once this goal is achieved, the country's total renewable energy capacity will reach 27 GW. In April, the government approved agreements for wind and solar power projects that will generate a total of 12 GW. As part of Uzbekistan's energy reforms, it is planned to include private investors in electricity distribution networks and double energy efficiency. Uzbekistan also aims to expand its renewable energy exports, particularly to European countries such as Hungary and Romania. It aims to increase green energy production to 13 billion kWh by 2024 and achieve a 15% share in the country's energy balance.[30]

Kazakhstan plans to invest 50 billion tenge (about $110.7 million) in renewable energy projects in 2024. The funds will be distributed as follows: 9 billion tenge (about $19.9 million) for wind energy projects, 13 billion tenge (about $28.7 million) for solar energy projects and 28 billion tenge (about $62 million) for hydropower projects. Renewable energy capacity in Kazakhstan has increased 16-fold, from 178 MW in 2014 to 2,868 MW in 2023, and this is a significant growth in this area.[31]

6. Azerbaijan and European Union Partnership for Green Energy

The EU has been continuously reviewing its green energy policies over the last fifteen years.

Russia's military operations against Ukraine urged EU countries to get on with the energy shift even faster. The REPowerEU plan which was launched after the Russia's operations and Covid 19 pandemic aims at accelerating the clean energy transition by diversifying supplies.

Main goals of EU for energy transition are (European Council):

a) to become more independent in energy trade, especially from Russia.

b) to decrease the use of fossil fuels and support the effective use of renewable energy sources

c) increase and improve energy efficiency and infrastructure in line with its integration across EU countries.

As it mentioned, EU's main goal is to diversify energy supplies and create a more competitive energy market. In this context, Azerbaijan becomes an important partner. Being a strategic and reliable partner for EU with its geological position and energy sources, Azerbaijan is an ideal country for the transportation of energy sources.

On 18 of July 2022, European Commission President Ursula von der Leyen and Energy Commissioner Kadri Simson held talks with Azerbaijan's President Ilham Aliyev and Energy Minister Parviz Shahbazov to bolster the ongoing cooperation between the EU and Azerbaijan. During the meeting, both presidents signed a new Memorandum of Understanding focused on a Strategic Partnership in the Energy sector.32 This key agreement outlines a commitment to increase the capacity of the Southern Gas Corridor pipeline to over 20 billion cubic meters (bcm) annually by 2027. This expansion aims to enhance energy security and diversify supply sources for the EU. By allowing the transport of greater volumes of natural gas from Azerbaijan to multiple European countries, the increased pipeline capacity will help reduce Europe's reliance on Russian energy and improve its resilience to potential supply disruptions.

The Memorandum of Understanding (MoU) also includes vital EU support to help Azerbaijan reduce methane flaring and venting in its gas production processes. This initiative aligns with global environmental standards and aims to assist Azerbaijan in joining the Global Methane Pledge. By implementing best practices and advanced technologies to reduce methane emissions, Azerbaijan can strengthen its environmental responsibility and contribute to global climate change mitigation efforts. The EU's backing in this area highlights a commitment to securing energy supplies while ensuring environmentally responsible production, reinforcing the shared sustainable development goals of both parties.[33]

President Von der Leyen said: *"Today, with this new Memorandum of Understanding, we are opening a new chapter in our energy cooperation with Azerbaijan, a key partner in our efforts to move away from Russian fossil fuels. Not only are we looking to strengthen our existing partnership which guarantees stable and reliable gas supplies to the EU via the Southern Gas Corridor. We are also laying the foundations of a long-term partnership on energy efficiency and clean energy, as we both pursue the objectives of the Paris Agreement. But energy is only one of the areas where we can enhance our cooperation with Azerbaijan and I look forward to tap the full potential of our relationship".*

In 2011, the Nabucco project failed due to obstacles created by Russia and difficulties in providing uninterrupted gas to the European Union. Following these developments, Azerbaijan and

the European Union signed a memorandum of understanding on the Southern Gas Corridor (SGC), which is considered a more effective and promising alternative to the Nabucco project. The SGC includes projects that will transport gas from Azerbaijan's Shah Deniz natural gas field to Southern Europe, especially Italy and Greece, primarily the Trans Adriatic Pipeline (TAP) and the Trans Anatolian Pipeline (TANAP).

Conclusion

The importance of transitioning to green energy lies in its potential to create a more sustainable, economically viable, and healthier future for future generations. To achieve this goal all countries should take responsibility and put ambitious effort to manage a healthy transition for green energy.

Map 1: Southern Gas Corridor

Source: SOCAR, 2024. (https://socar.de/en/socar-2/southern-gas-corridor/)

Azerbaijan is currently supplying 5% of Europe's energy needs by transporting Caspian gas to EU market through the Southern Gas Corridor. European Commissioner for Neighbourhood and Enlargement Policy Oliver Varhelyi visited Azerbaijan in February 2024. During this visit, he highlighted the critical importance of the Southern Gas Corridor for energy security in Europe. He also shared information that the European Union will provide financial support of €2 billion for energy projects in Azerbaijan. European Union also takes steps to strengthen the partnership with Azerbaijan in the field of green energy (European Commission, 2022).

European Union and Azerbaijan have reached an agreement to back the future growth of renewable hydrogen. TAP's capacity expansion could facilitate the transportation of additional quantities of hydrogen and other renewable gases to promote long-term sustainability and facilitate the energy transition in the region. The Green Energy Advisory Council 1st Ministerial Meeting has reinforced the foundation for future cooperation, highlighting Azerbaijan's significant potential to support European Green Deal initiatives. Azerbaijan aims to export both natural gas and green energy to Europe, as it seeks to enhance its strategic partnership with the EU. Both electricity and renewable hydrogen are set to become crucial sources of energy from Azerbaijan to Europe.[34]

Azerbaijan, aiming to diversify its economy and become independent of fossil fuels, is taking an active role in the field of green energy in cooperation with other countries and institutions.

The country has the potential to benefit from various renewable energy sources such as wind, solar and hydroelectric, and thanks to its geographical location and climate, it could use solar and wind energy effectively.

The Azerbaijani government has been concentrating on enacting policies that promote the development of renewable energy. This includes specific targets for renewable energy generation, incentives for green energy projects, and the establishment of laws and regulations to encourage investment in the sector.

Azerbaijan aims to increase the share of renewable energy sources in its portfolio. According to Azerbaijan's 2020-2025 strategic plan, it aims to provide 30% of its total energy production from renewable sources by 2030.

Azerbaijan has been seeking partnerships with other countries and international organizations to enhance its capabilities in renewable energy. Collaborating with countries experienced in green technologies can help Azerbaijan accelerate its energy transition.

Interest in renewable energy projects in Azerbaijan is constantly growing among both local and international investors. Various solar and wind energy projects developed in the country are adopting advanced technologies and best practices from around the world.

Increasing awareness and education regarding the benefits of renewable energy and sustainability practices is essential for gaining public support and encouraging participation in green energy transition.

Azerbaijan's journey toward a green energy future presents both challenges and opportunities. By leveraging its renewable energy potential and fostering a supportive policy environment, the country can play a significant role in global efforts to combat climate change while ensuring sustainable economic growth.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The authors confirm being the sole contributor of this work and have approved it for publication.

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