

Renewable Energy in the European Union

Alexandru Petrea

*PhD student, Doctoral School of the "Alexandru cel Bun" Military Academy, Chisinau, Republic of Moldova,
pcalex71@gmail.com*

ABSTRACT: The European Union has set ambitious targets for renewable energy, aiming to increase the percentage share of renewable energy in gross final energy consumption and promote its use in transportation and heating sectors. Romania, having a significant potential in renewable energy, especially wind and solar energy, can play an important role in achieving these goals. The exploitation of abundant natural resources and the development of production capacities in wind, solar and hydropower can contribute to the transition to a cleaner and more sustainable energy system, bringing economic and environmental benefits to the country and contributing to significant reductions in greenhouse gas emissions.

KEYWORDS: Renewable Energy Source, Energy Transition, Energy Policies, Energy Efficiency, Climate Goals, Sustainable Energy Technologies and Assessments

Introduction

The need for energy is increasing, as conventional sources are limited and unknown amounts of coal, gas and oil reserves are buried deep in the earth or under the ocean. Therefore, the identification of new sources becomes increasingly difficult and expensive, and exploitation is dangerous either because of accidents when drilling under the ocean floor or because of the need to burn large quantities of natural gas for refining, as we speak about oil sands. In addition, the use of nuclear fuels involves many risks that threaten both the health and safety of people and the environment. Human errors and colossal mechanical failures could generate huge costs and devastating effects on human health, killing thousands of people in the short term and tens of thousands in the long term, due to the radiation generated and large areas of radioactively contaminated land (Ernest & Young 2013). Moreover, global warming and energy crises have direct consequences on the quality of human life. Under these conditions, renewable energy sources are an option worthy of serious consideration by governments because they could be easily identified and explored without causing major accidents or hazardous situations affecting life on earth. Also, as technology and infrastructure improve, the energy produced will become cheaper and cheaper.

Despite the debates caused by the installation of costs in many countries, renewable sources are considered a key element in the European energy policy because they could cover a large part of the energy needs of the European Union. In addition, they help Europe maintain and defend its position as a global innovation leader by developing new technologies and generating employment opportunities. Renewable energies offer the member states of the European Union the opportunity to develop a competitive, reliable and sustainable energy sector, contributing to solving the most pressing energy problems and challenges facing the community - reducing countries' dependence on energy imports, especially fuel dependence fossils such as oil, coal and natural gas.

Types of energy used in the European Union

Different types of renewable energy are generally used to cover human energy requirements: electricity, heating, cooling and consumption in the transport sector. Currently, renewable energy sources - wind, hydropower and even biomass - are used to produce electricity, and their

share in electricity generation is expected to increase strongly in the future. Half of the final energy consumption in the European Union is used in the heating and cooling systems of homes. Although the potential of renewable energy sources such as biomass, solar and geothermal energy is enormous, they represent only about 12% of the generation capacity of this sector (Ernest & Young 2013).

The most important types of energy used in the EU are well known and we refer here to: *Electricity*, which is produced from sources such as fossil fuels (and here we include coal, oil and gas), nuclear power, hydropower, wind, solar, geothermal and waste. If in 2011, fossil fuels represented 49% of EU electricity production, while renewable energy sources represented only 18%, a decade later renewable energy sources are approaching the equivalent of fossil fuels, representing 32% of production of EU electricity (Mapped: Europe's Biggest Sources of Electricity by Country 2023).

Thermal energy used mainly for heating buildings and domestic hot water, which is produced from sources such as fossil fuels, biomass, waste and geothermal energy. In the EU, heating buildings represent around 40% of final energy consumption.

Biofuels are used as an alternative to fossil fuels, especially for transport and for heating buildings, they represent, according to the previously cited source, approx. 5% of current EU consumption. Biofuels are produced from organic materials such as energy crops, food waste and wood. They have been encouraged in the EU through support policies for renewable energy and meeting targets for reducing greenhouse gas emissions.

Natural gas, mainly used for electricity production and heating of buildings, is considered a cleaner alternative to coal and oil. In 2023, natural gas accounted for around 20% of the EU's energy mix (Mapped: Europe's Biggest Sources of Electricity by Country 2023).

Nuclear energy, used in particular for the production of electricity, represents an important source of energy in the EU which represents a percentage of 25% of the current energy mix.

Renewable energy has become an important topic in recent decades in the context of global concerns about reducing greenhouse gas emissions and global warming. An energy source is considered renewable if it can be regenerated in a relatively short time without running out or producing greenhouse gas emissions. In this article, we will look at four main sources of renewable energy used in the European Union: solar energy, wind energy, hydropower and geothermal energy.

Solar energy is one of the most well-known sources of renewable energy. This is produced by the sun and can be captured by solar panels and transformed into electrical or thermal energy. Solar panels are the most popular devices for capturing solar energy, and they can be used in a variety of applications, from heating water to generating electricity. In the European Union, solar energy is mainly used to produce electricity, but it can also be used to heat water in homes and commercial buildings. The development and diversification of solar energy storage technologies is also an important direction to follow in order to be able to use this source effectively.

Wind energy is another important source of renewable energy, produced by the wind and which can be captured by wind turbines and converted into electricity. Wind turbines can be installed on land or in the sea, where the winds are stronger and more constant. In Europe, countries with a long and deep coastline, such as Denmark, Germany and the United Kingdom, have great potential for wind power generation. In recent years, wind turbine technology has improved significantly, and the production of electricity by this method has become more and more efficient.

Hydropower is produced by falling water and can be captured by hydraulic turbines and converted into electricity. Hydroelectric plants are usually installed on rivers and lakes, and the energy produced can be used efficiently to supply electricity to consumers. Hydropower can

also be used for irrigation and water supply purposes, but it is important to consider the impact on the environment and ecosystems when building hydropower plants.

Geothermal energy is one of the most promising sources of renewable energy that can be used in a variety of applications, from generating electricity to heating and cooling buildings. This type of energy relies on the Earth's natural heat, which is produced by radioactive reactions inside the planet. This heat can be captured through geothermal wells, which extract warm water or steam from underground layers and use it to generate electricity or for heating. There are two main types of geothermal technologies: those that use hot water and those that use steam. The technology of using hot water is more common and more accessible, and involves the capture of hot water from underground layers by means of geothermal wells, which can have varying depths, depending on the geological characteristics of the area. Hot water is pumped to the surface and used to heat buildings or generate electricity. If the water temperature is high enough, it can also be used to produce steam, which in turn can be used to produce electricity. The technology of using steam is more complex and involves the capture of steam from underground layers, which can have very high temperatures and pressures. The steam is captured through deep geothermal wells, which can reach several thousand meters in depth. The steam is then directed to geothermal turbines, which convert it into electricity. Steam technology is more expensive and requires large investments, but can provide higher returns than hot water technology.

Geothermal energy has many advantages over other renewable energy sources. It is a permanent and inexhaustible source of energy that does not produce greenhouse gas emissions and does not pollute air or water. Also, geothermal energy is available in almost every region of the world and can be used in various applications, from heating and cooling buildings to generating electricity. However, geothermal energy also presents some disadvantages and challenges. One of the main obstacles to using this energy source is the high initial costs of geothermal drilling and power generation facilities.

The European Union has taken important steps to promote the use of renewable energy in recent decades, and we will mention the latest directions of action of the EU in this field. First, the EU has set ambitious targets for reducing greenhouse gas emissions and promoting renewable energy. By 2030, the EU has set out to reduce greenhouse gas emissions by at least 40% from 1990 levels and reach a target of producing at least 32% of its energy from renewable sources. These goals are consistent with the 2015 Paris Agreement, which aims to limit global temperature increases to less than 2 degrees Celsius above pre-industrial levels.

The European Union has also developed a number of initiatives and programs to encourage the development of renewable energy. One of these is the Erasmus+ program which provides funding for projects that promote sustainability and sustainable development, including renewable energy projects. The EU has allocated significant funds for the research and development of renewable energy technologies through the Horizon 2020 programme.

The European Union has also taken steps to encourage the use of renewable energy at local level. The European Territorial Cooperation Program, also called Interreg, aims to promote cooperation between regions in different countries to encourage sustainable development and economic growth. This program has funded several renewable energy projects at the local level. In addition, the EU has adopted a number of directives and regulations to promote renewable energy and prevent the use of more polluting energy sources. The Renewable Energy Directive, adopted in 2018, sets targets for each member state regarding the percentage of renewable energy produced by 2030. The EU has also adopted regulations to promote the efficient use of energy and encourage investment in technologies of renewable energy.

In addition to these initiatives, the EU has also developed a number of partnerships to promote renewable energy beyond its borders, for example the Sustainable Energy Partnership with Africa, launched in 2018, aims to encourage renewable energy investment in Africa.

Romania's potential in terms of renewable energy

The commitment of the European Union to promote and support the transition to a cleaner and more sustainable energy system based on renewable sources is found in the clear and well-defined objectives it has proposed for the coming decades. In this sense, the European Union (2009) has established ambitious objectives established within the Renewable Energy Directive (Directive 2009/28/CE) and updated under the Renewable Energy Directive (Directive (EU) 2018/2001, European Union 2018). The main objectives of the EU in the field of renewable energy include the establishment of percentage shares of renewable energy - by 2030 - at least 32% of the gross final energy consumption will be covered by renewable sources; an objective of the percentage share of renewable energy in the transport sector was also set so that by 2030, a percentage of 14% of the energy used in transport should come from renewable sources. It adds the target of the percentage share of renewable energy in the field of heating and cooling which stipulates that by 2030, the EU aims for at least 1.5% of the final energy consumption for heating and cooling to be provided by renewable sources. However, in 2021 renewable energy accounted for 21.8% of energy consumed in the EU, down from 22.1% in 2020 (Eurostat, Statistics Explained 2023) due to the social context strongly marked by the global medical pandemic and the Russian-Ukrainian war. We can say that the year 2022 was the ultimate “shock therapy” for the use of renewable sources but the experience of learning and adapting to the market is the bright side of things. Becoming the world's first climate-neutral continent by 2050 is the goal behind the European Green Deal, COM(2019) 640 final (European Commission 2019), which is the very ambitious package of measures that should enable European citizens and businesses to benefit from a sustainable ecological transition. Aligning with the “Energy Policy for Europe”, and Romania developed the Energy Strategy for the period 2018-2030 in line with the energy objectives of the European Union outlined in the “European Strategy for sustainable, competitive and secure energy”.

Romania has a significant potential in terms of renewable energy, but the implementation of projects in this field has been long delayed. Unfortunately, the transition to a green economy has been slowed down by several factors, including the lack of coherent policies and a stable and predictable legislative framework. We will explore Romania's position in the transition to the implementation of renewable energy projects and what can be done to accelerate this process.

The primary objective of sustainable energy development is the promotion of energy production based on renewable resources. From a statistical point of view, we are doing very well in this chapter because we managed to reach the target of 24% renewable energy foreseen for 2020, since 2017, a large part of this success is due to the consumption of hydro energy. We must also mention that the production of renewable energy in Romania is significant, ranking the country in second place in the region, after Poland, and at a considerable distance from other European states (Romanian National Institute for the Study of the Development and Use of Energy Sources 2020).

According to Eurostat data, in 2019, renewable energy represented 29.4% of Romania's final gross energy consumption, with a significant increase compared to the previous year. Of this percentage, hydroelectric power accounts for the largest share, followed by wind and solar power. However, Romania's renewable energy potential has not yet been fully exploited. In its 2019 report on renewable energy, the European Commission highlighted that Romania still has a long way to go to meet its renewable energy targets by 2020 and to meet its long-term climate goals. Romania has set ambitious targets for renewable energy. In the National Energy Strategy for the period 2020-2030, Romania aims to increase the share of renewable energy in the energy mix to 30.7% by 2030. The country has also set the objective of reaching a share of 10% of the energy of road transport coming from renewable sources by 2020, and by 2030, this objective

is 14%. Thus, in order to achieve the level of ambition regarding the share of energy from renewable sources of 30.7% in 2030, Romania will develop additional SRE capacities of approximately 6.9 GW compared to 2015. In order to achieve this target, it is necessary to ensure financing appropriate from the EU in the sense of ensuring an appropriate adequacy of the electrical networks, but also the flexibility of the production of E-SRE by installing back-up capacities on natural gas, storage capacities and the use of intelligent techniques for the management of electrical networks. To meet these objectives, Romania has implemented a series of policies and measures regarding renewable energy. They include a number of tools to accelerate the development of the field.

The Casa Verde Photovoltaic Program is an important government program aimed at the promotion and development of solar energy in Romania. This program was launched in 2019 and aims to finance the installation of photovoltaic systems for the production of electricity at the level of households and small and medium-sized enterprises.

The support program for the development of renewable energy capacities (*Green Energy Program*) is an initiative of the Romanian Government, launched in 2016, with the aim of promoting and developing the production of electricity from renewable sources. Through this program, renewable energy project operators can obtain financial support in the form of a guaranteed preferential tariff for a period of 15 years, so that they can cover the investment costs and ensure a corresponding profit. Preferential tariffs are established for each type of renewable energy separately and are revised annually according to production costs and market developments. Renewable energy sources eligible under the Green Energy Program include solar energy, wind energy, hydroelectric energy, biomass and biogas energy, and geothermal energy. The Green Energy Program had a positive impact on the development of renewable energy capacities in Romania, contributing to attracting investments in this sector and increasing the production of electricity from renewable sources. In the first two phases of the program, which took place between 2016 and 2020, funds were allocated to more than 3,000 renewable energy projects with a total installed capacity of more than 5,000 MW.

Currently, the Green Energy Program is in the third stage of implementation, which will end in 2023. This stage aims to attract investments in renewable energy projects in the disadvantaged regions of Romania, so as to ensure a balanced development of electricity production from renewable sources throughout the country.

We can say that Romania has an important position regarding the transition to the implementation of renewable energy projects, benefiting from important natural resources and a favorable legislative and financial framework. The Green Energy Program played an important role in the promotion and development of this sector, contributing to the increase in the production of electricity from renewable sources and to the reduction of dependence on fossil energy sources. However, there are still many challenges to overcome, such as the improvement of renewable energy infrastructure and storage capacities, so as to ensure a more efficient and sustainable use of these clean energy sources.

In addition to the two programs mentioned, there are other initiatives that encourage the development of renewable energy. Thus, another important program is the High Efficiency Cogeneration Support Program (*Cogeneration Program 2016-2020*). This program was implemented by the National Energy Regulatory Authority (ANRE) and aims to support the production of electricity and heat through high-efficiency cogeneration. Cogeneration refers to the simultaneous production of electricity and heat, which leads to greater efficiency than if these two types of energy were produced separately. The high-efficiency cogeneration support program provides cogeneration certificates for units that meet the efficiency criteria established by ANRE. These certificates can be sold to electricity suppliers, which can generate additional income for power producers.

Consequently, the use of renewable energy in Romania's economy has been growing steadily in recent years, although still below the EU average. In 2020, the total electricity

production from renewable sources was 13.5 TWh, representing 18.6% of the total electricity production in Romania.

Hydro energy is the most important source of renewable energy in Romania, representing over 90% of the total electricity production from renewable sources. In 2020, hydro energy represented 16.9% of the total electricity production in Romania. This is due to the rich hydrological resources in the country, especially in the Carpathian area.

Wind and solar energy are important sources of renewable energy in Romania, but their production is still relatively small. A systematic inventory study of the theoretical wind potential for the entire national territory was carried out by ICEMENERG in 2006 and provided a potential value of about 23 TWh/year through the installation of capacities with a total power of about 14,000 MW. The wind potential determined in 2006 must be adjusted taking into account the subsequent establishment of Natura 2000 protected areas as well as flight paths for wild bird populations, elements that diminish the options for developing new projects in the Dobrogea region. In 2020, wind energy represented 1.5% of the total electricity production in Romania, and solar energy only 0.2%. However, there is significant potential for the development of these renewable energy sources in Romania, especially in regions with high wind or solar radiation potential (The Romanian National Institute for the Study of the Development and Use of Energy Sources 2020, 421). The construction of photovoltaic parks benefited from a support scheme in the period 2009-2016, according to Law 220/2008. The establishment of Natura 2000 protected areas, as well as the restriction of the development of photovoltaic parks on agricultural land surfaces, limits the options regarding the installation of new large photovoltaic parks only on degraded or unproductive land.

In addition, Romania has committed to meet its renewable energy targets set by the EU, which stipulates that 32% of gross final energy consumption should come from renewable sources by 2030. To achieve this target, a significant increase in the production of electricity from renewable sources, but also the use of renewable sources in other sectors, such as transport or heating.

In conclusion, the use of renewable energy in the Romanian economy is increasing but still below the EU average, and the Government has taken measures to support the development of renewable energy through financing programs and support schemes, but a continuous effort is needed to reach the objectives established in the field. For Romania, capitalizing on the potential of renewable energy sources aims to increase the security of energy supply, by diversifying sources and reducing the weight of the import of classical energy resources, with the aim of sustainable development of the energy sector, environmental protection and reducing dependence on the import of energy resources.

Adapting the economy to new energy sources

Regarding the promotion of investments and the development of infrastructure for renewable energy, the EU encourages Member States to take measures to support investments in renewable energy and the development of infrastructure necessary to facilitate the integration of renewable sources into the energy system and encourages the development and implementation of innovative energy technologies renewables, as well as their integration into sustainable energy solutions.

Around the world, developing countries are looking to rapidly scale up investment in renewable energy. This shift to renewable energy is driven by a number of considerations. Many developing countries are struggling to meet rapidly growing energy demand as rising global fuel prices and resource scarcity make them vulnerable to oil prices. At the same time, the cost of renewable energy technology has seen remarkably steady declines over the past few decades, nearly 98% for solar PV modules since 1979 (IRENA 2012). It has been suggested that a

technology push by a few pioneer countries could continue to drive down technology costs, allowing renewable energy to overtake fossil fuels by the end of this decade. However, the barriers to a large-scale transition to renewable energy in developing countries are not only in the costs of the technology, but in the challenges of securing affordable long-term financing. Financing cost is the primary determinant of generation cost for renewables, such as renewable energy (other than biomass and biofuel) has no fuel costs but has high initial investment costs. (Waissbein et al. 2013 - Derisking Renewable Energy Investment).

Policymakers can use a number of different tools to address the risks of renewable energy investments and their associated barriers, and certainly some types of tools have gained more prominence than others. Mechanisms that provide renewable energy suppliers with development, a power purchase contract, which ensures a long-term fixed price for the energy supplied and guaranteed access to the electricity grid, are considered the cornerstone of the tools for efforts to transform the renewable energy market. The severity of investment barriers in renewable energy varies between countries, technologies and banking systems. The European Union has adopted a series of financial instruments to facilitate the development of the field even in this special geo-economic context.

The renewable energy market in Europe has grown significantly in recent years, particularly due to targets and policies on reducing greenhouse gas emissions and the transition to a low-carbon economy. Many factors influence the outlook for the European renewable energy market, such as energy policy, financial support, technological innovations and the economic interests of member states. However, it is important to note that strategies and energy policies may vary according to each member state of the European Union.

The increase in the supply of renewable energy has major implications for technological transformations in various industrial branches. This transition to a green and sustainable economy involves a paradigm shift from an economy based on fossil fuels to one based on renewable energy sources such as solar energy, wind energy, hydropower and geothermal energy. The energy industry is one of the most affected by this transition. It must adapt its infrastructure and technology to be able to manage energy produced from renewable sources. For example, traditional power grids need to be upgraded to be able to handle more variable and distributed energy in a more efficient way. In addition, the development of energy storage technologies is essential to manage the energy fluctuations produced by renewable sources.

The automotive industry is also affected by the transition to a green economy. In recent years, the automotive industry has begun to focus more and more on electric and hybrid vehicles, which use electricity as a source of propulsion. This has led to the development of new technologies, such as high-performance batteries, which are able to store a larger amount of electricity. In addition, electric cars require a charging infrastructure that allows fast and easy charging of batteries.

The construction industry is also affected by the transition to renewable energy. Buildings must be built to be more energy efficient by using new technologies such as solar panels, geothermal and advanced thermal insulation. In addition, these buildings need to be connected to smart grids and energy storage systems in order to be managed efficiently.

In general, the increase in the supply of renewable energy brings with it a number of opportunities and challenges for different industries. Technology development and infrastructure adaptation are essential to be able to cope with the transition to a green and sustainable economy. At the same time, there are opportunities to develop new markets and create new jobs within the renewable industry. However, there are still many challenges to overcome in terms of the costs and infrastructure needed to enable an efficient and sustainable transition to renewable energy sources. The adaptation of Romania's economy to the new sources of renewable energy is a complex process that involves both technological changes and changes in economic policies and infrastructure investments. In the coming years, renewable energy is expected to become an increasingly important part of Romania's energy mix, and

adapting the economy to this transition is essential to ensure sustainable development and a more competitive economy.

One of the main ways to adapt Romania's economy to renewable energy is through the development of clear and coherent energy policies. These policies should stimulate investment in renewable energy sources through fiscal measures, subsidies and other financial instruments. In addition, it is important to have a robust and predictable legislative framework to ensure the safety of investments in renewable energy and protect the interests of investors. Significant investment in infrastructure is also required to support the transition to renewable energy. This includes the development of electricity distribution networks as well as the necessary infrastructure for energy storage, such as batteries or other storage technologies.

Investments in smart grids and energy monitoring and control technologies are also essential to ensure efficient and secure distribution of renewable energy.

On the other hand, adapting the economy to renewable energy will also bring with it significant opportunities for the development of new economic sectors. This will create new jobs and boost economic growth in innovative sectors such as green technology and the development of new renewable energy technologies. In addition, the transition to renewable energy will have a positive impact on the environment, reducing greenhouse gas emissions and other pollution affecting air and water quality.

In conclusion, adapting Romania's economy to renewable energy is an essential process to ensure sustainable development and a more competitive economy in the future. This will involve significant investment in infrastructure and clear energy policies to boost investment in renewable energy sources and protect investors' interests. In addition, the transition to renewable energy will bring with it significant opportunities for development. In this sense, Romania has developed a series of programs and strategies to adapt to new sources of renewable energy. In 2015, the Romanian government adopted Romania's Energy Strategy for the period 2015-2035, whose main objective is to increase the share of renewable energy in the energy mix and reduce greenhouse gas emissions. This strategy was updated in 2019, in line with the European Union's objectives of reducing greenhouse gas emissions by at least 40% by 2030.

In addition to support programs, adaptation to new renewable energy sources also required significant investments in infrastructure and electricity distribution networks. In this sense, Romania received European funding through the European Regional Development Fund (ERDF) for the development of renewable energy infrastructure and the modernization of electricity distribution networks.

Also, companies from different industrial sectors had to adapt to the new sources of renewable energy by developing innovative technologies and solutions. For example, in the telecommunications equipment manufacturing industry, solar power solutions have been developed for base stations, which provide an independent and environmentally friendly power source. In the automotive industry, the development of renewable energy storage technologies has led to the development of new products and services. For example, charging systems have been developed for electric cars, which use solar or wind energy to power the cars. These solutions have helped to increase interest in electric cars and develop a complete ecosystem of charging infrastructure.

Conclusion

The use of renewable energy has many potential benefits, including a reduction in greenhouse gas emissions, diversification of energy supplies, and reduced reliance on fossil fuel markets (especially oil and gas). Increasing renewable energy sources can also boost employment in the EU by creating jobs in new "green" technologies. Romania has significant potential in renewable energy, especially in wind and solar energy, due to abundant natural resources. The

wind sector has seen significant growth in recent years, while solar energy benefits from a favorable climate and a generous number of sunshine hours. Also, hydroelectric energy represents an important source in the country, with possibilities for the development of micro hydropower plants and the modernization of existing hydropower plants. The exploitation of these resources can contribute to the achievement of the EU's renewable energy objectives and bring significant economic and environmental benefits to Romania.

References

- Ernst & Young. 2013. Renewable energy country attractiveness indices (RECAI). February 2013. Uk: Ernst & Young Global Limited.
- European Union. 2009. Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. *Official Journal of the European Union*, L 140/16. Available at <https://eur-lex.europa.eu/eli/dir/2009/28/oj> accessed on May 22, 2023.
- European Union. 2018. Directive (EU) 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources. *Official Journal of the European Union*, L 328/82. Available at <https://eur-lex.europa.eu/eli/dir/2018/2001/oj>, accessed on May 22, 2023.
- European Commission. 2019. "The European Green Deal." Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2019) 640 final. Brussels.
- Eurostat. Statistics Explained. 2023. "Renewable energy statistics." Available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Main_Page, accessed on May 20, 2023.
- IRENA 2012. Renewable Power Generation Costs in 2012: An Overview, <https://www.google.com/search?client=firefox-b-d&q=IRENA%2C+2012a>, accessed on May 23, 2023.
- Romanian National Institute for the Study of the Development and Use of Energy Sources. 2020. „Review on the Use of Renewable Energy Sources in Romania.” In *Energetica*, Vol. 68, no. 9. p. 418.
- Mapped: Europe's Biggest Sources of Electricity by Country. 2023. By Niccolo Conte in *Elements, VisualCapitalist.com*. <https://www.visualcapitalist.com/mapped-europes-biggest-sources-of-electricity-by-country/>, accessed on May 20, 2023.
- Waissbein, Oliver, Glemarec, Yannick, Bayraktar, Hande, and Schmidt, Tobias S. 2013. "Derisking Renewable Energy Investment. A Framework to Support Policymakers in Selecting Public Instruments to Promote Renewable Energy Investment in Developing Countries." UNDP. <https://www.undp.org/publications/original-drei-report>.