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THE GREEN TRANSITION AND ENERGY SECURITY IN THE WESTERN BALKANS COUNTRIES

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Abstract: The global energy markets are destabilized as the result of the crisis in Ukraine and sanctions against Russia. Such adversely developments has additionally undermined the energy security of the Western Balkans countries that are faced with consequences of the global surge in energy prices. Due to the range of the current economic and security challenges in the context of the ongoing energy crisis, the burning question that arises is how to coordinate the goals of environmental protection with energy security.

The Green Agenda for the Western Balkans as a regional strategy for the sustainable energy transition was launched in October 2020 by signing the Sofia Declaration, which relies on five crucial pillars: decarbonisation and climate resilience, depollution, circular economy, sustainable food system and rural areas, biodiversity. This Declaration foresees the commitment of these countries to the target of making the continent carbon-neural by 2050 by phasing out coal subsidies, introducing carbon pricing instrument and renewables support schemes.The problem for Western Balkan countries relies in the fact that their energy mix is dominated by coal, while only Albania mainly relies on hydropower to meet its energy needs. The coal-fired power plants are denoted as the main cause of environmental degradation in this region, hence these countries committed themselves to decarbonize the energy sector. However, due to the possible deterioration of energy crisis, the plans to phase out coal-fired power plants has been postponed over the next few years.

Using a comparative analysis method, we will explore the structural developments of electricity generation and the possible capacities for use of renewables. We will also highlight the challenges for given countries to meet energy security goals.

Keywords: Western Balkan countries, energy security, energy dependence, green transition, renewables

Introduction

The climate change is one of the main global threat to humanity due to long-term ecologically irresponsible behaviour marked by the excessive consumption of non-renewable energy sources (such as oil, coal and gas). The cause of this problem, but at the same time its solution is energetics which has crucial role in the foundation of economic development. Decarbonization of the electricity sector, namely the reduction and eventual cessation of using fossil fuels for electricity generation, represents a strategic commitment to energy development. An effective energy transition should provide energy security, i.e. sufficient and affordable supplies and prevent economic shocks, along with the potentional political consequences (Yergin, 2022). A fundamental barieer for sustainable energy transition represents the balancing the provision of reliable and cost-effective electricity for consumers with the imperative to reduce pollution. The energy transtion is in the light of new challenges, as policymakers must address pollution reduction amidst energy crises and energy shortage while taking into account energy security.

In response to the current global context (the COVID-19 pandemic, rising energy costs, conflict between Russia and Ukraine), the costs associated with decarbonization highly increased, triggering an energy crisis, which directly reflected on the energy security. The sudden surge in energy prices, since the summer of 2021, has caused a big dilemma for policy-makers worldwide how to protect energy security and accomplish goals related to sustainable environment. Taking into account the current situation, governments need to find way how to resolve issues related to energy trilemma: energy security, sustainability and affordability (Hussain et al., 2023). Since energy crisis has several facets such as fossil fuels, energy prices, climate change, food security, inflation and COVID-19 pandemic aftermath, it underscores the need for a more comprehensive and holistic approach. Moreover, besides influencing the shift in their energy priorities and visions, the conflict in Ukraine has brough policymakers from EU members states in a situation that involves a struggle to preserve current energy security due to the cessation of cooperation with Russia and addressing issues related to the process energy transition without reinforcing additional high-carbon dependencies (Höysniemi, 2022).

The energy security, as an equivalent of national security, represents one of the main priorities of all countries around the world, which is closely interconnected with economic development, geopolitical tensions and environmental protection. In order to preserve the priorities of energy

policy, and above all energy security, the emphasis is on diversification of sources and routes of supply and integration of energy markets to ensure a stable and long-term sustainable supply of energy. While Western European countries intend to enhance their energy security through phasing out fossil fuels from their energy portfolio and foster the usage of renewable energy sources (RES), oil and gas exporting countries strive to preserve their energy self-sufficiency by appling a 'wait and watch' approach (Crowley-Vigneau et al., 2023).

Western Balkan (WB) region is facing a range of challenges due to its fragile energy security. These countries are traditionally highly dependent on imports of Russian oil and natural gas, which is directly reflected on the decline in their energy security. By introduction of the the hard-hitting sanctions imposed on Russia, their energy security is further destabilized. According to the OECD (2022), the main cause of the region's fragility stems from fluctuations in prices within the regional wholesale electricity markets.

Despite abundant potential for renewable energy, the region lag behind the EU in the transition from coal to clean energy sources.The green transition in the WB region, which implies the provision of a sufficient amount of energy in an economical, energetic and ecologically acceptable way, has been called into question due to the high dependence on coal for electricity generation and obsolete energy systems. By signing Green Agenda for the Western Balkans, the governments of these countries have gain a difficult task to protect energy security and reduce environmental pollution in the condition of rising prices. The transition to ecologically sustainable energy sources is a complex and inevitable process that will enable them to preserve energy security and yield numerous positive effects, particularly in the long run.

The aim of this paper is to address the current state of energy security and structure of the electricity generation in the WB countries. In section 1, we present the definitions of energy security and its strategies in the context of global turbulences and highlight the importance of renewable energy sources for protecting energy independence. In section 2, we show the association between energy security and rising energy poverty, while, in sector 3, we point out the significance of nuclear energy as a robust solution for addressing issues related to energy poverty and environmental degradation. Section 4 focuses on the issues related to navigating green transition in WB region. In section 5, we show the specificity of the energy sector and their potential for electicity production from renewables.

Energy security and renewable energy sources

According to the International Energy Agency (2024), the energy security can be defined 'as the uninterrupted availability of energy sources at an affordable price'. The UNDP (2000) also defines energy security as 'the continuous availability of energy in varied forms, in sufficient quantities and at reasonable prices'. The basic components of energy security are availability of resources, reliability of supply, environmental sustainability and affordability of energy sources. Energy security includes not only supply of power and fuels, but also optimization of energy usage for greater efficiency. The renewable energy, as effective strategy for broadening the energy mix, contribute positively to energy security, while the energy security positively affect the renewable energy amidst geopolitical risk (Khan et al, 2023). By increasing energy efficiency, along with the use of RES, there is a significant impact on enhancing the competitiveness of the domestic economy, reducing business costs and cost of living, preventing the spread of energy poverty and increasing energy sovereignty.

The energy security can be achieved through three fundamental strategies like supply diversification, enhancing energy efficiency and accelerating the transition to renewable energy as a substitute for fossil fuels (European Commission, 2023a). Its objectives vary depending on a country's role within the energy market. The importance of energy security is also evidenced by the fact that it can and must be considered within the context of geopolitics (Proroković, 2020). From the perspective of energy security, countries that belong to the group of fossil fuel producers/exporters strive to provide consistent demand for their goods. Considering that their economies depend on the export of hydrocarbons (crude oil and natural gas), the energy transition could cause the loss of the usual sale markets and part of income, and create new risks associated with energy security (Borovsky, 2021). They are burden with high financial and technologial costs of decarbonizing their energy sector, among other things, because of the risk of sanctions against exporting countries. For some exporters, especially those with a high share of fuel rents in GDP and insufficient financial reserves, the energy transition can also result in serious socio-economic and political turbulences. Fuentes et al. (2020) argue that countries typically formulate strategies with the intention to maximize the exploitation of their own energy resources. For instance, the countries owning conventional fossil fuels are ready to exploit them for improving their energy security by applying the all-of-the-above strategy, suggesting the use of nonrenewable

and renewable sources of energy, as well as the expansion of the renewable energy installations (for example, China and the United States).

On the other hand, the consumer nations, including those within the EU, seek to broaden their energy sources to reduce reliance on imports and enhance security (Rabi et al. 2022). The widespread adoption of renewable and other low-carbon energy sources will alleviate key risks for oil, gas, and coal-importing countries, potentially enabling them to achieve energy independence. These countries try to decrease energy consumption and increase the share of renewables in their energy demand, while reducing their addiction to the fossil fuels. However, the emergence of new risks stemming from the post-carbon era cannot be ruled out (Borovsky, 2021). That is why it is of crucial importance for this group of countries to "move towards a 'security-centred' energy transition, premised on 'security first, compliance second' (Marhold, 2023).

Bearing in mind the divergent energy security perceptions and priorities related to green transition, Pérez et al. (2019) distinguish two clusters of countries among EU Member States. The first one is green cluster consisting of countries located in the western region of Europe, which perceive renewable energy as a win-win, business opportunity and strategy for reducing the import dependency on fossil fuels. The second blue cluster encompasses countries situated on the periphery of Europe, which are deeply concerned about their energy security (energy supply and diversifications of energy sources). The use of renewable source of energy is seen as win-lose. This group of countries are characterized by high import dependency and strong market concentration, which make them very sensitive to external shocks. Such different energy strategies between EU member states could jeopardize the energy strategy and call into question the green transition.

The renewable energy stock are important for enhancing energy independence whose role is especially pronounced at times of heightened geopolitical turbulence. Igeland et al. (2024) point out that the economic policy uncertainty has positive effect on the returns of renewable stocks, while the renewable energy is seen as stable investment in conditions of macroeconomic fluctuations and crisis. The authors warn against negative impact of the prices of green metals such as nickel, copper, cobalt and zinc on the renewable stock, indicating that energy security can be jeopardized by the consequences associated with the renewable energy transition without effective management. Ivanovski and Marinucci (2021) who find negative long-run relationship between economic policy uncertainty and

renewable energy consumption have revealed the similar findings. In the condition of high and strong political and macroeconomic imbalances, in order to maintain their energy security, the countries will be forced to give up the use of RES, at least in the short and medium run. The need to ensure a stable and safe supply of electricity due to the stochastic nature of renewable sources has prompted the emphasis on energy security as a leading factor in energy policy.

Aslam et al. (2024) stress out that the shift from traditional fossil fuel-based energy sources to renewables significantly reduce energy security risk with the usage of renewable energy sources in the countries of the Belt and Road Initiative (BRI). According to their findings, the energy security risk is embodied by the energy production using fossil fuels, expenditure on fuel imports, the fluctuation of oil pices, the intensity of energy use in transportation, as well as the creation of a sustainable environment with reduced CO2 to GDP intensity. Kim et al. (2024) demonstrate that the shift towards economically sustainable growth and an economy is expected to yield a favourable impact on energy security, contingent upon investments being directed towards mitigating the emerging risks associated with heightened dependence on renewable sources. The authors point out that two essential determinants of energy security are diversification and political risks, so policymakers should consider how they are interwined with the green transition. Boosting domestic fossil fuel production at the cost of increased pollution could enhance energy independence but endanger the progress of the green transition, as well as long-term energy security. Chu et al. (2023) highlight that geopolitical tensions have a beneficial impact on the adoption of renewable energy for high-income countries, while they have a detrimental effect on the utilization of renewables in middle-income countries. Due to growing energy insecurity and geostrategic uncertainties, funding a balance between energy independence, economic development, and sustainability objectives will be a hard challenge. The energy crisis has brought to the forefront the aspiration to establish a balance between immediate energy requirements and ensuring long-term energy stability.

It should be highlighted that the transition to clean, sustainable energy and renewables can cause additional dependencies. The usage and inclusion of renewable energy sources in the energy matrix can cause the rise of conflicts and weaken energy resilience. Amidst the ongoing energy crisis, it is evident the geographical clustering of manufacturing facilities for modern clean energy generation equipment, which directly affects on the establishment of a new reliance for inputs and commercial partners (Gaspar

Filho & Santos, 2022). Therefore, consistent provision of essential non-fuel minerals at a reasonable cost is vital for ensuring energy security and facilitating the ongoing transition in energy systems. The transition to 'green' energy is influenced by a combination of political and environmental motives. Crowley-Vigneau et al. (2023) point out that the political objective of achieving energy independence through renewable sources may be within reach for certain countries within a few decades, whereas global climate change mitigation would likely require a significantly more time. The mass development and construction of renewable energy projects occur due to the need for energy stability, high electricity prices, and a general fear of shortages of all energy sources. Unfortunately, the ecological, social, and health components of the importance of renewable energy sources have taken a back seat.

The prevealing belief is that sustainable energy security could be achieved with the help of the massive investment in a mix of clean energy technologies, from solar and wind energy to nuclear power, 'green' hydrogen, electric vehicles, and carbon capture technologies (Bhatt, 2023). However, there is a dilemma whether these 'clean' sources are environmentally acceptable, i.e. whether their use can reduce pollution and at the same time increase economic growth. For instance, Ahn et al. (2021) argue that enhancing the share of renewable energy sources within the energy portfolio reduces social welfare as the adverse impact of reduced cost-efficiency offset the benefits of reduced climate damage on social welfare. Moreover, some authors argue that the impact of renewable energy on economic performance largely depends on the extent of renewable energy deployment. For example, Chen et al. (2020) demonstrate that developing countries experience negative impact if the usage of renewable energy is below a certain threshold. However, these countries could offset the adverse impact of renewable energy utilization over time due to higher levels of renewable energy adoption. Dogan et al. (2020) find evidence that renewable energy consumption has detrimental impact on economic growth in high-income OECD countries. On the other hand, there seems to be a positive relationship between renewable energy consumption and economic performance in lower to low-middle income countries.

Furthermore, it should be noted that the benefits of renewable energy sources are often exaggerated while potential negative effects are overlooked (Zvezdanović Lobanova et al. 2019). In addition, it should be highlighted that all renewable energy sources have an impact on the environment, with some of them leaving stronger consequences. The impact they will have depends

primarily on the characteristics of the technology used, geographical location, and numerous other factors. If each of these clean energy sources is adequately assessed, it becomes more than evident that 'sustainable' does not simultaneously mean 'harmless'. Namely, some renewable energy sources lead to a reduction in carbon dioxide emissions during their period of use, but the overall effects that occur throughout their entire lifespan are often underestimated. What can be emphasized with certainty is that fossil fuels – coal, oil, and natural gas – contribute more to environmental damage compared to renewable sources. Therefore, the effects of renewable energy, as a key component of climate change mitigation strategy, must be appropriately considered in the broader context of biodiversity, ecosystem protection, energy security and sustainable economic development.

Energy security and energy poverty

The interdependence between energy security and energy poverty are very complex due to the fact that renewable energy sources may produce cost savings and improve energy efficiency in the long-term, while there can be short term obstacles and risks associated with affordability and alleviation of social inequalities. Although there is no clearly established definition of energy poverty, this term most often refers to 'the inability of keeping the home sufficiently warm' (European Commission, 2023b). Namely, it considers a condition in which the household lacks sufficient means to obtain the necessary amount of energy required for a healthy and dignified life, in a manner that does not jeopardize other basic household needs or the wider community. Limited income, disproportionate energy expenses and low energy performance of buildings cause the energy poverty. Energy-poor residents are not able to provide themselves with sufficient heat in the households or affort essential energy sources. Energy poverty causes economic, social and health problems which manifest consistently throughout the year, spanning both the summer and winter seasons. Its consequences are numerous, ranging from an increased number of deaths during winter and health issues such as colds, cardiovascular and respiratory diseases, to mental health problems like anxiety, stress, and depression (Petovar, 2022).

Unfortunately, the energy poverty has been exacerbated even further due to inflationary rise in energy prices, geopolitical tensions and economic and financial repercussion of the COVID-19 pandemic (Lobanov et al., 2022; Carfora and Scandurra, 2024). Due to the drastic decision to completely

abandon the purchase of Russian gas, consumers were exposed to price fluctuations. Concerned about their energy security, the majority of households was obliged to provide locally available heating fuels such as firewood and pellet, which cased the increase in their price, exacerbating issues related to energy poverty (RES, 2023). Energy poverty is most prevalent in countries in Central, Eastern, and Southeastern Europe, primarily affecting marginalized groups (European Parliament, 2023). In order to prevent the poorest citizens from becoming victims of energy transition, numerous EU member states are striving to assist through various means such as issuing energy vouchers (as seen in France), reducing energy taxes, lowering value-added taxes, providing direct subsidies to the most vulnerable residents, offering payments to energy producers to reduce consumer prices, as well as implementing a range of other measures (as observed in Spain, Greece, Italy, Poland, etc.). EU has adopted a set of recommendations outlining measures and policies for addressing energy poverty in its member states. Protecting vunerable citizens and reducing of energy poverty, as a cornerstone of European Green Deal (EGD), involves granting subsidies for energy vulnerable households, improving insulation and energy properties of buildings, as well as using efficient and health-safe local heating sources.

Green transition and nuclear power

The social pressures exerted by deepening energy poverty have a major impact on the reconsideration of the energy transition. On the other hand, green transition was designed with the aim of being fair, which means that no one whose income depends on fossil fuels should be left in poverty by abandoning them and switching to renewable energy sources. According to the majority of the expert and scientific community, the remedy for this difficult state of affairs is still seen in the increasing use of renewable energy sources, while some even emphasize the use of nuclear energy, which could strengthen the resilience and stability of the energy environment. Moreover, nuclear energy is stress out as a robust solution for addressing issues related to energy poverty and environmental degradation.

Bagus and Peña-Ramos (2023) argue that the adverse effects resulting from the implementation of the energy transition, such as high energy prices and uncertainty related to supply opportunities, could be avoided, while energy security could be ensured through nuclear power plants. According to the IEA (2022), nuclear power, as the second largest low-emission energy

source after hydropower, could allow countries to safely switch to energy systems dominated by renewable energy sources. Thanks to its potential, nuclear energy-producing countries could reduce their dependence on fossil fuel imports, harmful gas emissions, ensure the integration of a higher share of solar, and wind energy in electricity systems. Kocak et al. (2023) found that electricity from nuclear power prove to have reducing effect on energy powerty in middle and low-income countries, but insignificant in high-income countries. In addion, the authors stress out that renewable and hydroelectric power play a crucial role in both mitigating greenhouse gas emissions and alleviating energy poverty.

Many countries are considering the role of nuclear power plants in the electricity generation, while most scientific and professional public are concerned about the safety of atom energy production and the storage of nuclear waste. Despite the tendency to be denoted as a green source, nuclear energy cannot be classified as such. According to the IEA's plan to reach net zero by 2050, nuclear power could double between 2020 and 2050, if new facilities are constructed (IEA, 2022). It should be noted that nearly two-thirds of nuclear power generation capacity comes from more than 30-year-old facilities, many built after oil shocks in the 1970s. The nuclear energy and coal are crucial parts of European energy security in short and medium run, so any attempt associated with their replacement or reconfiguration of energy mix in the European energy mix is accompanies with great risks and obstacles (Joița et al., 2023).

Navigating green transition in Western Balkans

The integration of the WB countries into the European energy market was accomplished by creation of the Energy Community for South-Eastern Europe in October 2005 in Athens. The Treaty establishing the Energy Community came into power on July 2006. The contracting parties are the European Community on one side, and all the WB countries, as well as Romania, on the other. Besides further strengthening of foreign trade relations, among the primary goals of the Energy Community are: creation of an integrated and coherent market for natural gas and electric energy, establishment of integrated markets for other energy sources, attraction of investments in gas networks, energy production, and energy transmission networks; improvement of the environmental conditions in the region in the context of energy supply and resources, as well as promotion of the energy efficiency enhancement and the utilization of renewable energy sources, etc. (Ministarstvo za evropske

integracije, 2024). In 2016, all WB countries signed the Paris Agreement and committed themselves to combat climate change by reducing greenhouse gas emissions and transitioning to a low-carbon economy.

In December 2019, EU launched the EGD with the intention to overcome problems associated with climate change and environmental degradation. Its primary goal is to make EU as the first climate neutral continent with zero net emissions of greenhouse gases by 2050 and provide sustainable economic expansion independent of resource consumption (European Commission, 2024). Considering the obstacles and disturbances observed in the global energy sector, the European Commission adopted the REPowerEU plan in May 2020 with the aim of saving energy, generating power through renewable energy sources, diversifying energy supply and increasing energy efficiency. The energy transition is projected to reach 45% of energy from renewable sources by 2030.

By signing the Sofia Declaration on the Green Agenda for the Western Balkans (GAWB), at the WB Summit in the Berlin Process framework, in 2020, and endorsing the Action Plan of the Green Agenda for the Western Balkan at the Brno Summit in October 2021, the countries of the region acknowledged the EGD as the European Union's new growth strategy towards a modern, climate-neutral, and competitive economy that efficiently utilizes resources (European Commission, 2020). The GAWB is based on the EGD and the associated Economic and Investment Plan for the Western Balkans. This Agenda relies on five pillars – decarbonisation and climate resilience, depollution, circular economy, sustainable food system and rural areas, biodiversity – that are in accordance with the objectives of the EGD. In order to become climate-neutral by 2050, WB countries have agreed to align with with the established guidelines concerning the reduction of carbon emissions within the energy sector under the Energy Community framework; create national energy and climate plans; address energy poverty, conduct an evaluation of the socio-economic effects of decarbonization in the region; renovate both private and public buildings and secure financing for these renovation schemes and integrate with the Initiative for coal regions in transition (OECD, 2022). In accordance with the Action Plan, the WB countries adopted the 2030 climate and energy targets under the Energy Community Treaty in December 2022. These targets involves carbon pricing, cessation of coal usage, pollution mitigation measures, conservation of natural environments and biodiversity, fostering regional cooperation, and a provisional schedule for alignment with the EU Emissions Trading System in 2024 (RCC, 2024).

In November 2022, the WB leaders signed the Declaration on Energy Security and Green Transition which recognizes the need to transform economies and energy sectors to meet international obligations envisaged by the Energy Community Treaty, the Paris Agreement and the EGD. By creating Initiative for coal regions in transition in the Western Balkans and Ukraine, the EU has further encouraged the governments of these countries to focus on the implementation of projects that are significantly delayed. Their previous efforts have been focused on the electricity sector, although the Green Agenda for the Western Balkans covers wide range of areas, from circular economy to agriculture (Gallop, 2022).

In addition, by signing the Declaration on the Green Agenda for the Western Balkans, countries have, among other things, committed to apply the Carbon Border Adjustment Mechanism (CBAM) created by the EU with the aim of imposing carbon taxes on imports from countries that do not have a similar carbon price system, introduce market models for encouraging RES and fully eliminate coal subsidies. According to the Energy Community (2023), over the past five years (2018-2022), WB countries allocated EUR 405.52 million in subsidies for coal-based electricity production. The CBAM will further increase the pressure on them to align their energy policy with the EU's climate goals. The start of the transition period of the carbon tax (CO2 tax) was on October 1, 2023 and is scheduled to last until the end of 2025. The Energy Community Contracting Parties are entitled to an exemption for import of electicity until 2030. This will create serious changes in business conditions for companies from the WB that export cement, electricity, fertilizers, steel, iron, aluminum and hydrogen to the EU, but also certain products obtained from them, for example, screws and various structures (European Commission, 2023c). Companies will be obliged to measure the amount of CO2 emissions emitted in the production of goods they export to the EU and inform the company to whom they have sold the goods. Besides enabling their business partner in the EU to comply with CBAM regulations by reporting their emissions, exporters will also help themselves, as they will be able to assess how the cross-border CO2 tax could influence the price of their products in the EU market and their competitiveness. The extent to which the WB region will be affected by these measures is also indicated by the fact that over two-thirds of the region's goods exports are destined for the EU, while an additional 20% are directed to regional trading partners, who are also closely interconnected with the EU economy (RES, 2023). Furthermore, these countries are expected to continue aligning with the greenhouse gas emission trading system. This system entails allocating a certain number of permits to polluters (primarily

companies in the industry, energy, and transportation sectors) for greenhouse gas emissions. If they wish to exceed their allocated quota, they must purchase permits from others who offer parts of their unused quotas.

The specifity of energy sector in Western Balkans

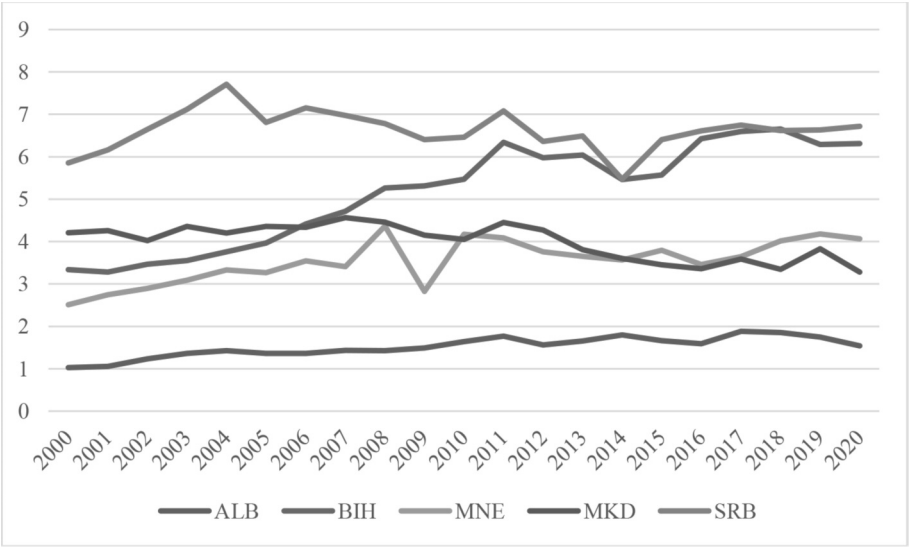
The 2021 energy crisis has influenced the dynamics of the energy transition of the WB countries and changed their plans for the transition from fossil to RES. Since it has left significant consequences on their economies, population and energy sector, the crisis has influenced the rethinking of the need to implement the energy transition, which these countries have not yet recognized as a development opportunity, but rather as a threat. The transition is seen as something that is imposed externally, and in order to preserve energy security, the process of abandoning the use of coal for electricity production is trying to postpone as long as possible. Due to concerns about their energy security, North Macedonia, Serbia and BiH decide to boost coal production in order to meet the demand of existing and newly established thermal power plants (TPP). Namely, although they initiated the development of integrated national energy and climate plans, no official decisions on decarbonization have been made, nor has a social consensus been reached on it.

Many cities and towns in WB are among the most polluted settlements in Europe due to power plants and heating which are denoted as crucial factors of environmental degradation in these countries. The majority of them use coal-fired power plants for electricity generation, which directly calls into question their ability to meet the requirements stated in the EGD. They possess outdated coal-fired TPPs, which cause significant electicity losses, as there has been no investment in building new electricity generation capacities for decades. In addition to the aforementioned shortcomings, a delayed adoption of renewable sources (with the exception of hydropower and bioenergy), high energy consumption per unit of output, limited private sector involvement, and inadequate market mechanisms for addressing energy poverty mark the WB energy sector.

Due to the effects of climate change driven by industrial operations, the utilization of coal in energy and heating sectors, along with insufficient energy efficiency, the average annual temperature in WB countries increased by 1.2 °C compared to 1970 (Knez et al. 2022). As it can be seen from figure 1, Serbia and BiH are with the highest air pollution in WB region as they rely heavily on electricity generation from coal usage. According to the

World Bank (2024), Serbia annually releases a greater amount of CO2 than all other WB countries together. Serbia and BiH had the highest per capita CO2 emissions among WB countries in 2020, at 6,71 and 6,31 metric tons per capita, respectively (see Figure 1). Albania's level (1,54) is half those of the Montenegro (4,06) and less than a fifth of those of Serbia.

Figure 1. CO2 emissions (metric tons *per capita*)



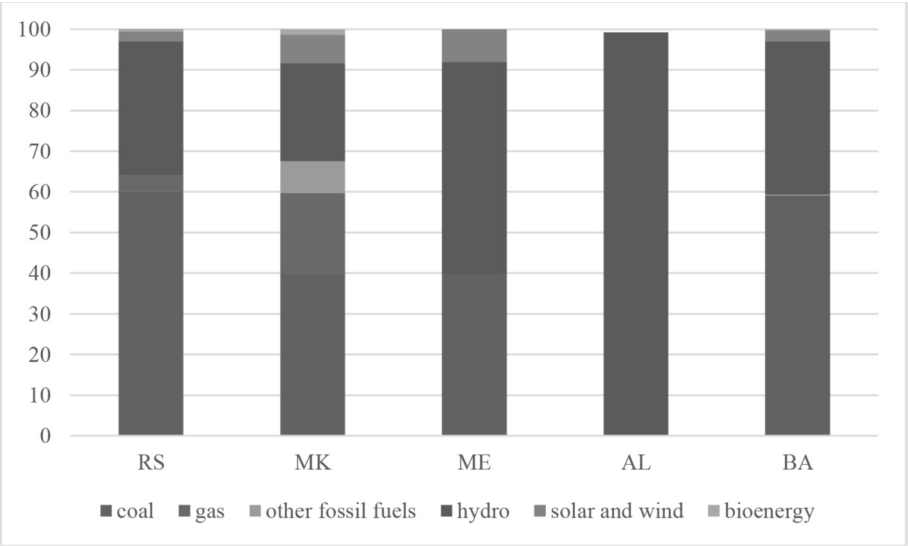
Note: AL – Albania; BA – Bosnia and Herzegovina; MK – North Macedonia; ME – Montenegro; RS – Serbia.

Source: World Bank (2024).

Regarding the electricity generation by energy source, each of the WB countries possesses a unique energy profile (see Figure 2). Serbia and Bosnia and Herzegovina have significant reserves and local production of low-grade lignite coal, which satisfies approximately two-thirds of their total domestic gross energy consumption. In 2023, in Serbia and North Macedonia 70% of electricity was generated by combustion of fossil fuels. Based on the European Commission, approximately 138,000 jobs are associated with coal across the WB nations, with 90,000 in mining and 49,000 in coal-based TPPs (BiEPAG, 2023). By relying on the estimates from the same source, phasing out coal in accordance with the EU policies could potentially result in a

reduction of 0.4% of total employment in Montenegro, 0.5% in North Macedonia, 0.6% in Serbia and 1.3% in Bosnia and Herzegovina.

Figure 2. Electricity generation by energy sources in 2023 (in %)



Note: AL – Albania; BA – Bosnia and Herzegovina; MK – North Macedonia; ME – Montenegro; RS – Serbia.

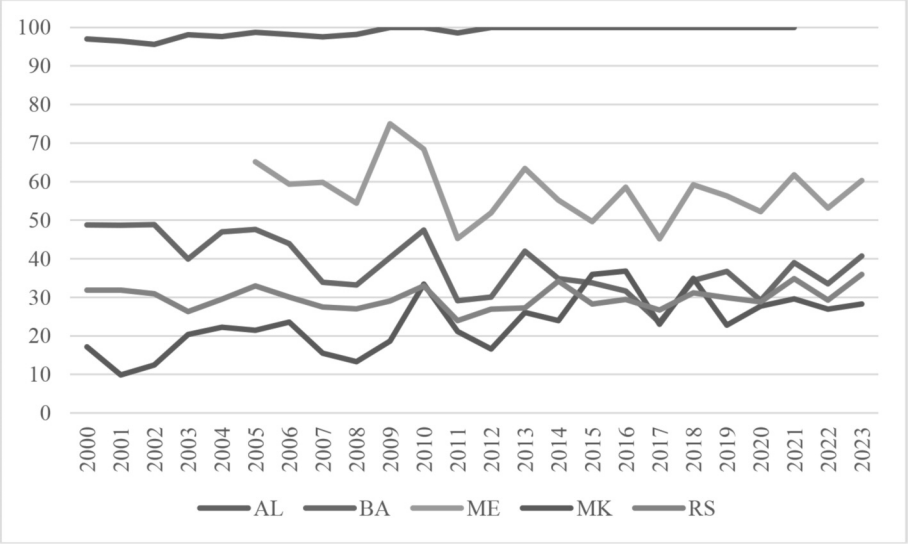
Source: Authors' elaboration based on Ember (2024).

After coal exploitation, hydroenergy represents the second most utilized source for electricity production in WB countries (see Figure 4). Albania relies heavily on hydropower, with nearly 100% of its electricity being generated from its three primary hydropower plants (HPP) - 'Vau i Dejes' (260MW), 'Fierza' (500MW) and 'Koman' (600MW). Such high dependence on this energy source exposes these countries to the risks posed by unforesseable weather conditions such as droughts. Montenegro relies only on thermal and hydro power plants. It is notworthly that North Macedonia has the highest level of diversity in its electricity supply as it generates electicity from coal, hydropower, natural gas, solar and wind, including other fossil fuels.

When it comes to the utilization of RES, it is noticeable that they hold an undesirable share in electricity production, despite the significant potential they possess (with the exception of Albania) (see Figure 3). In the early 2010s,

the wave of mass construction of mini HPPs mainly derivative type affected all WB countries. Mini HPPs on rivers have been promoted as one of the main ways to increase the share of energy from renewable sources, while neglecting the efficiency of wind and solar. Insisting on utilization of mini hydroelectric power plants as "sustainable" alternatives to traditional sources for electricity production did not yield the expected results, as the damage caused by their construction outweighed the benefits of utilizing the hydroenergy potential of watercourses. The majority of WB countries are energy-poor and heavily dependent on importing energy resources from Russia. North Macedonia and Bosnia and Herzegovina rely entirely on natural gas imports from Russia, while the Serbia's share amounts to 89% (Cretti et al., 2022). However, upon examining their energy portfolios in 2023, it becomes evident that natural gas only played a role in the energy mix of North Macedonia and Serbia. In North Macedonia, its share in total electricity production was 19.8%, while in Serbia, it accounted for 4.1%, making these countries more sensitive to trade shocks and political pressures.

Figure 3. Electricity generation by clean energy sources in 2000-2023 (% of total)

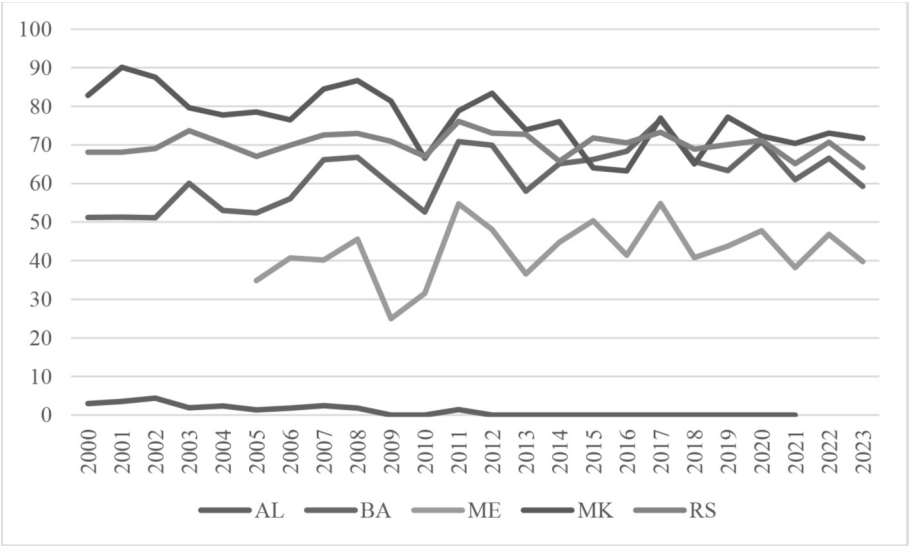


Note: AL – Albania; BA – Bosnia and Herzegovina; MK – North Macedonia; ME – Montenegro; RS – Serbia.

Source: Authors' elaboration based on Ember (2024).

Besides great potential for renewable energy in WB region, lignite and other types of brown coal are essential to the energy landscape of the WB, constituting approximately 70% of the region's electricity generation (with the exception of Albania, which is characterized by developed hydropower) (see Figure 4). Unfortunately, this energy source is one of the main air polluters, which abundant availability significantly affects its pricing. This lower quality coal is extensively utilized to operate TPPs, leading to pollution through the release of toxic elements into the air, such as sulfur dioxide or particles of arsenic, nickel, potassium, lead, etc. In condition of the extensive use of coal for electricity generation, there is a trade-off between economic performance and environmental sustainability (Mehred, 2021).

Figure 4. Electricity generation by fossil fuels in 2000-2023 (% of total)



Note: AL – Albania; BA – Bosnia and Herzegovina; MK – North Macedonia; ME – Montenegro; RS – Serbia.

Source: Authors' elaboration based on Ember (2024).

The energy sector of the WB countries remains largely under the control of state-owned utility corporations. The legacy of former Socialist Federal Republic of Yugoslavia (with the exception of Albania) had crucial impact on the current state of WB' energy systems (Ralchev, 2012). Each country of

the region has its own specifics, as in terms of the current energy mix, consumption tendencies, economic conditions, development aspirations and socio-economic parameters. The region has key geographical positioning since it is located at the crossroads of the primary hydrocarbon transport pathways from regions abundant in energy resources to industrialised and energy consuming regions. Unfortunately, none of these countries has been able to take advantage of the benefits they have as energy resources transit countries in their favour.

The energy security of the WB countries will be notable enhanced in the upcoming years. A new coal-fired power station, Kostolac B3 (350 megawatts (MW)), has been constructed by Chinese companies, and its inclusion in the energy grid is expected by the April of 2024. Construction works on the Buk-Bijela HPP on the Drina River (a joint project with BiH) (115 MW) started in May 2021, but they have been slowed down due to the dispute between the Constitutional Court of BiH and the Consession Commission. The strategic projects that will also notable boost the share of RES in the total electricity generation are the construction of the reversible HPP Đerdap 3 (2400 MW) and Bitrica 2 (656MW) (Zvezdanović Lobanova and Lobanov, 2023). In order to ensure diversification of gas supply choices, a project for the construction of the Nis-Dimitrovgrad-Bulgaria gas pipeline was launched and released in December 2023. The construction of the Trans-Balkan Electricity Transmission Corridor, which is underway will significantly improve the safety and quality of the electricity supply. This is one of the leading projects within the EU Economic and Investment Plan for the Western Balkans, which will contribute to establishing a regional electricity grid connecting the transmission systems of Bosnia and Herzegovina, Montenegro, and Serbia with Croatia, Hungary, Romania, and Italy through a 400 kV transmission line. Through the Western Balkans Investment Framework, the project of rehabilitation of the electro-mechanical components and supporting network of the Fierza HPP in Albania is also foreseen.

All countries of the region that are dependent on coal are facing a difficult and complex period of transformation of municipalities and regions, as coal was the basis of the development of their economic structure. WB countries are reluctant to participate in the implementation of the green transition due to fears that the immediate closure of the mines, countries would pay a price for such activities in the form of imports of electricity whose high price would be transferred to the final consumer, reducing the share of domestic electricity producers in the market. Such developments

would reduce countries' competitiveness, security, production, and supply, while external influences would further shake energy security and independence. Regardless of their preferences, all countries in the region will be forced to carry out the transformation of state power generation utilities (building new capacities and modernization of existing ones) to force environmental projects. This type of project should ensure a balance between energy and ecology, with a reliable supply of electricity.

By providing suport in defining and cordinating energy policies of the WB countries, the EU is placing significant emphasis on enhancing their energy security. The EU has adopted a €1 billion energy support package to assist the WB in addressing immediate short-term and medium-term energy needs, accelerate decarbonization, and bolster energy independence. The intention is to provide support for small and medium-sized enterprises and the vulnerable households, alongside with the speeding up the diversification of energy sources and enhancing their efficiency and boosting renewable energy generation (EIB, 2022). EU will also provide the opportunity for the WB countries to join the EU Energy platform for voluntary joint purchasing of natural *gas, liquefied natural gas and hydrogen*. In accordance with REPowerEU, this EU energy platform was launced not only with the aim of demand aggregation, but also to optimize the utilization of current infrastructure and establish global engagement.

Table 1. Imports of natural gas from Russia, in thousand million cubic metres

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
BA	186	218	227	245	244	230	210	253	-
MK	134	135	211	271	251	292	334	432	287
RS	1395	1740	1795	2182	2198	2262	1989	2365	2965

Note: BA – Bosnia and Herzegovina; MK – North Macedonia; RS – Serbia.
Source: Eurostat (2024).

The recent BiEPAG study (2023) related to the exploration of external influence in the energy sector shows that there is a public support for environmentally friendly transition, whereas it exists a lack of recognition regarding the adverse consequences associated with external actors such as Russia, Turkey and China (as their projects give rise to discussions regarding governance issues and their environmental impact). The energy sector is a

crucial target for Russian investments, with notable investment activity in Serbia and BiH (Vulović, 2023). In line with its Belt and Road Initiative (BRI), China has fostered investment in a range of areas, including infrastructure development, agriculture, mining and energy (Stekić, 2023). Chinese FDI was directed in highly pollutive sectors, marked by poor environmental governance (for instance, in Serbia) (Krstinovska, 2023). Their projects are not aligned with the EU acquis or the Paris Agreement and represent a big concern.

Conclusion

The energy security has become urgent concern firstly due the sudden upsurge in energy demand after the COVID-19 pandemic, the strong increases in natural gas and coal prices, electricity price jump and hostilities in Ukraine. WB region is facing a range of challenges due to its fragile energy security. Moreover, the green transition has also been called into question due to the high dependence on coal for electricity generation and obsolete energy systems. Concerns related to energy poverty and high electricity bills also represent the major reasons behind the resistance to energy transition. There is a justified fear that the energy prices in the region would rise and reduce energy security in case of becoming an EU member state as power generation would become subject to CO2 pricing within the framework of the EU's emissions trading system.

The WB countries have not made significant progress in the field of renewable energy sources. The majority of electricity in Serbia, Bosnia and Herzegovina, Montenegro, and North Macedonia is still generated from fossil fuels, primarily coal, while the remainder mostly comes from hydroelectric power plants. Inefficiency, technological obsolescence, and low-quality coal contribute to high emissions of pollutants that endanger health. It is essential to significantly improve energy efficiency and create an energy mix that will guarantee both energy security and environmental protection. In the next few years, the allocation of energy resources, diversification of energy sources, and reduction in import dependence will represent the most significant challenges for the energy sector in the WB countries.

Energy transition should bring significant changes to these countries in terms of environmental protection, whereas it should be sustainable and relatively equitable, meaning that the burden and benefits of the transition should be evenly distributed. Of crucial importance will be the full participation and agreement of all stakeholders (citizens, local communities, and industry), taking into account the specificities of sectors and regions

that rely heavily on fossil fuel use. Successful energy policy is possible in such challenging times only with a strategic approach to green transition, emphasizing sustainability and energy independence. Energy independence of these countries would significantly contribute to strengthening their international position and provide them with flexibility in foreign policy. In order to provide resilience against unprecedented energy shocks, government should invest efforts and resources into modernization of the outdated electricity grid, diversification of energy sources and security supply and increasing energy efficiency. The green energy sector is expected to provide stability in supply and availability of energy and energy sources, while taking into account the environment protection.

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