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KEYWORDS	ABSTRACT
Ukraine, Russia–Ukraine War, Energy Security, Economic Security, Sanctions, Reconstruction, Renewable Energy, European Union	The energy plays key role in the security and economic development of all nations. This has become abundantly clear during the Russia–Ukraine war. Since, large-scale attack of Ukraine by Russia in February 2022, numerous key energy infrastructure sites have been damaged, destroyed in Ukraine. As a result of these attacks, Ukrainian households, businesses, industries, hospitals, and public services have faced the serious issues. They have also caused the larger economic issues for the country. Meanwhile, US and other western countries have implemented economic & energy sanctions against Russia. The sanctions are designed to cut Russia's oil and gas revenues and make it harder for Russia to finance the war. But Russia has altered some of its trade routes and boosted energy supplies to nations not under Western sanctions. Thus, effect of energy sanctions is not definitive. In this article, the authors analyze correlation between energy security and sanctions to economic security in Ukraine. The study contends that Ukraine should not just restore the pre-war energy system. Rather a new system decentralized, diversified, renewable, and modern and closely linked to European energy markets be built. The article ends by stating that reconstruction of energy is a significant component of the long-term economic and national security policy of Ukraine.
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INTRODUCTION

In the modern era, one of key resources needed in the country is energy. There is a need for a country to have electricity, oil, natural gas and other energy sources for the industry, agriculture, transport, hospitals, schools, businesses and homes. As for this, energy security is linked with economic security and national security (Cherp & Jewell, 2014). This relationship is demonstrated in Russia–Ukraine

war. For past two years, Ukraine's energy sector has faced recurring attacks in context of full-scale attack of Ukraine by Russia since Feb, 2022. Severe damage to power plants, electricity networks, substations, gas facilities and heating systems. Ukraine suffered significant damage to its power generation capacity in attacks in 2024, as per International Energy Agency (IEA, 2024). About 9 gigawatts of generation capacity were lost in Ukraine during spring of 2024 alone, with country retaining only one-third of its generation capacity at that time (Sovacool & Mukherjee, 2011). It's not just an electricity issue. A massive amount of energy is used in nearly all aspects of the economy. In order to make products, factories require electricity. Agricultural activities need farmers to have fuel and electricity.

The electricity is needed in hospitals to operate medical equipment. Families require energy to heat and cook. Thus, any disruption in energy supplies becomes an issue for the economy. International Monetary Fund (IMF, 2024) also noted that attacks on the energy infrastructure in Ukraine were posing further economic risks. The Ukrainian economy was very resilient but it was marred by the ongoing energy infrastructure attacks, which brought uncertainty towards economic growth and recovery. The reconstruction plan for the future is very big. According to latest joint World Bank (WB), Government of Ukraine (GOU), European Commission (EC), United Nations (UN) recovery/reconstruction assessment, Ukraine will require nearly US\$588 billion in recovery/reconstruction investments over the next 10 years (World Bank, 2026). One of the key sectors that need to be rebuilt is energy. (World Bank). In this connection, one of the key aspects of the economic sanctions against Russia is energy. Similarly, the restrictions on Russian oil, gas, coal, financial transactions, energy technology and services in the United States, European Union and G7 countries and their partners. An important measure has been the price cap policy for Russian oil, which G7 countries have implemented.

The primary goal of this policy is to decrease Russia's oil revenue, but not cause any significant oil shortage on international market. There is evidence that energy sanctions can lead to substantial financial losses for Russia (Wachtmeister, 2022). Sanctions, however, have had an economic impact on countries that put them into place. Nguyen, Ngo, and Nguyen (2024) discovered that sanctions had an impact on the energy sector of sanctioned countries, particularly in the initial stages of the current war. The EU has developed a strategy for REPower EU to mitigate reliance on Russian fossil fuels and enhance energy security in Europe (European Commission, 2025). This is also change that is meaningful for Ukraine. Thus, European cooperation can offer investment, technology, access to electricity markets, and technical know-how to Ukraine. The central theme of the article is the need to take energy security as an important aspect of Ukraine's economic security. The rebuilding of Ukraine should be an opportunity for the country to create a more modern and powerful energy system. The reconstruction of destroyed infrastructure be based on decentralization, diversification, renewable energy sources and energy storage, energy efficiency & cooperation with Europe, rather than their repair.

Background of Problem

Prior to the war, Ukraine's energy system was complex and extensive. It consumes nuclear, thermal, hydropower, natural gas, coal and renewable energy. Ukraine also possessed significant electricity

and gas transmission lines linking it to the European and regional markets. But a lot of the energy equipment was outdated and very centralized. The system was lot influenced by large power plants and major transmission facilities. The future energy security of Ukraine can be more closely linked with the energy markets in Europe. This gave rise to a problem during the war as the destruction of the few big centers can have a significant impact on a large part of the country. This weakness was revealed in the Russia's attacks. According to [IEA \(2024\)](#), attacks between March and May 2024 resulted in the destruction or damage of approximately 9 gigawatts (GW) of generation capacity. The electricity networks and substations were also attacked. The district heating and gas lines were damaged as well.

Ukraine has made efforts to fix the system and make it more resilient. But this issue has persisted. According to [IEA \(2025\)](#), Ukraine's energy infrastructure remained a frequent target of Russian missile and drone attacks and the country's power and natural-gas systems were still seen as being at serious risk over 2025. These issues have also significant economic consequences. Without power, companies can't function. It may be necessary for companies to purchase generators and fuel. Cost of production increases. The employees can be absent from work. The government spending also rises as the state is forced to repair the damage to infrastructure and emergency support is needed. The challenge for reconstruction is, therefore, far greater than the challenge for rebuilding the power plants. Thus, Ukraine should develop a new energy system that will be able to power the broader economy for decades.

Research Questions

1. How has the Russia–Ukraine war affected Ukraine's energy security and economic security?
2. What role have energy sanctions played in Russia's energy revenues and Ukraine's security environment?
3. How can Ukraine develop more secure, resilient and economically sustainable energy system during the post-war reconstruction period?

LITERATURE REVIEW

The issue of energy security is now one of standing in international relations and economic research. In previous discussions, primary concern had been on availability of energy resources in countries. The energy security today is more broadly defined. They encompass the availability, affordability, reliability, sustainability and resilience of energy systems ([Sovacool & Mukherjee, 2011](#)). [Cherp and Jewell \(2014\)](#) also claim that energy security can be defined as protection from significant risks to vital energy systems. The geopolitical dimensions of energy are also high. [Goldthau and Boersma \(2014\)](#) demonstrate the economic advantages and political dangers of energy links between Russia and Europe. The European countries were very significant customers for Russian energy, and Russia was an important energy supplier to Europe. The war demonstrated that such reliance can turn into a security issue. Russia–Ukraine war has also increased research on Europe energy security. [Murray and Hinthorn \(2023\)](#) concluded Europe faced very large rise in fossil fuel costs as a result of Russian attack. Their work shows that energy insecurity result in huge economic losses. Decentralization is proposed as a means to enhance the energy security in Ukraine, based upon research into its future energy system.

According to the [IEA \(2024\)](#), small generation units, solar energy, wind energy, and battery storage are examples of DERs that can be tapped in Ukraine. The IEA subsequent analysis clearly indicates that distributed solar and battery storage are part of future energy security in Ukraine ([IEA, 2025](#)). As [Tröndle \(2024\)](#) suggest, Ukraine can reconstruct its energy system in a manner that enhances its security and sustainability in the environment. The study indicates that renewable energy can play a significant role in Ukraine's energy system of the future. In the literature, the picture is less clear regarding sanctions. [Wachtmeister \(2022\)](#) demonstrate that imposition of Russian oil restrictions can lower Russian oil revenue. [Nguyen \(2024\)](#) demonstrate that sanctions can have an impact in countries where they are applied on energy firms as well. This means that there is both a cost and benefit to sanctions for other countries. So, the literature indicates that there is a close relationship between energy security, economic security and sanctions. But many studies focus on the individual problems. This article is intended to put them together and to discuss the future reconstruction in Ukraine. It believes that energy reconstruction can also be used to increase the economic security of Ukraine as a whole.

Theoretical & Conceptual Framework

The ideas of energy security and economic security were used in this study. Energy security is a situation in which a country has access to energy supplies that are reliable, affordable, diverse and sustainable. If a nation is safe from all internal and external threats, that nation is economically secure. These two types of security go hand in hand. The damage to energy supplies could mean that factories might cease to operate, businesses may lose profits, unemployment may rise, government expenditure may go up. Without power, companies can't function. It may be essential for companies to purchase generators and fuel. This can turn into economic insecurity in this way. It works the other way around. A robust and secure energy system enable businesses, industries, jobs, investment and economic development. Thus, the reconstruction of energy system of Ukraine can contribute to the reconstruction of its economy. The central theme of this article is that a more diversified and decentralized energy system in Ukraine, as well as closer ties with Europe, can enhance country's economic security.

RESEARCH METHODOLOGY

This article is of qualitative research approach. It is based mainly on secondary sources. These can be academic journal articles, books, reports by international organizations, EU documents or analysis of energy sector studies. The primary sources are publications by the International Energy Agency, World Bank, European Commission, International Monetary Fund, International Renewable Energy Agency (IRENA), other international bodies. Academic research on energy security, on sanctions, on renewable energy and on European energy policy is used as well. Descriptive and analytical study is used in the study. First, this describes what the war has done to Ukraine's energy system. Second, it looks into the part of Russia's sanctions. Third, it looks at potential trends for Ukraine's future energy reconstruction. In this drive, the study mainly covers the period after Russia's full-scale attack in 2022 and looks toward the future post-war reconstruction period. The war, however, is still ongoing, and the article does not focus on the reconstruction after the war, but rather on a situation that is still yet to happen.

Energy Destruction & Ukraine's Economic Security

Energy infrastructure destruction has emerged as one of the key economic issues that emerged from the war. The use of electricity is required for almost all aspects of contemporary economic activity. Hence, the impact of electricity supply damage upon multiple sectors is widespread. According to [IEA \(2024\)](#), the Ukraine's generation capacity was reduced by approximately 9 gigawatts (GW) during the large-scale attacks between March and May 2024. This was predominantly thermal and hydropower generating capacity. There were numerous power substations that were damaged. These strikes left a huge power deficit. Things continued to be tough in 2025. Russia kept targeting Ukraine's electricity and natural-gas grids ([IEA, 2025](#)). Ukraine made progress in repairing its system, but the ongoing attacks continued to make the system vulnerable. These energy issues impact enterprises and areas of life. There may be a decrease in manufacturing in some factories. When electricity is limited, it can cause issues with survival needs such as food, communication and heating. The households in poverty and disadvantaged groups are more likely to be exposed to increased energy costs, and may be affected more due to lack of resources to cope. Thus, the energy crisis turns into an economic-security issue. Economic recovery is more challenging when energy system is weak.

Russia's Sanctions & Economic Power

The energy sanctions are an important part of the international response to Russia attack. The main idea behind these sanctions is to reduce Russia's income from oil and gas. Russia is a significant oil provider and exporter, making oil vital facet in its energy sector. The price-cap system is intended to curb price Russia can charge for its oil, while still permitting oil to flow to international markets. As [Wachtmeister, Gars, and Spiro \(2022\)](#) have demonstrated, restrictions and discounts on Russian oil can result in huge losses for the Russians. Their research looked at quantity limits as well as price cuts and concluded that either of these could hurt Russian oil profits. But Russia's energy trade has not been halted entirely due to the sanctions. A proper assessment of sanctions' effectiveness should not be based upon the cessation of Russian energy exports. Thus, a more telling question is whether sanctions are hurting the Russian profits and increasing costs, curtailing access to technology, and making it harder for Russia to sustain its energy industry. [Nguyen, Ngo, and Nguyen \(2024\)](#) also demonstrate that the impact of sanctions may be felt in countries that impose sanctions on energy companies. Their research analyzed 57 countries and their energy companies, and concluded that energy-stock returns were impacted by the diverse sanctions, particularly in the initial phase of the conflict. Sanctions can thus be useful, provided that they are international, strictly enforced, and periodically changed.

European Energy Security Review

The war between Russia and Ukraine has dramatically affected the European energy policy. Prior to 2022, Russia was a significant exporter of oil and natural gas for a number of European countries. This relationship brings economic gains and dependence. The European countries started searching for other providers after the Russian attack. They also boosted energy efficiency and consumption of renewables. The REPowerEU strategy aims to phase out the EU's Russian fossil fuel addiction and strengthen energy security in Europe. [European Commission \(2025\)](#) indicated that Russian fossil fuel imports to EU have significantly decreased as 2021. The EU has followed this policy. European

institutions had taken a step closer to phasing out Russian gas and increase energy diversification efforts by 2026. This is significant in the case of Ukraine as Ukraine will be more integrated with the European energy market. Such collaboration can provide Ukraine with an opportunity to tap into the European electricity market, investment, technology and technical know-how. Thus, the European energy integration can also help to lessen Ukraine's reliance on Russia and improve the country's security.

Energy reconstruction in Ukraine after War

One of the largest issues in the reconstruction of Ukraine's energy sector will be the rebuilding of its energy system. It is, however, an opportunity as well. After the war, Ukraine cannot just rebuild the same energy system that was in place pre-war. If the current system is extremely centralized and susceptible, it might be possible to replicate it again down the line and have the same problems arise. The [IEA \(2024\)](#) suggests a more distributed electricity system for Ukraine. This implies that more small and medium sized energy facilities should be utilized rather than relying too much on a few large power plants. Distributed energy resources may be solar panels, wind power, small gas plants, battery storage, and other local resources. These systems can increase the flexibility of the electricity network and can make it harder to destroy it entirely. The IEA's 2025 report also calls for increased development of distributed solar power and battery storage. Under the agency's 2030 path, Ukraine will require more than 24 GW of additional DSPV and 5.6 GW of new battery storage by the 2030 ([IEA, 2025](#)). In this connection, this can further strengthen and make more flexible Ukraine energy system.

Energy & Economics Renewal

Renewable energy has the potential to be an important part of Ukraine's future. Clean energy from the sun, wind, biomass and other sources can help the Ukraine to generate more energy within its borders. Renewable energy can also aid security. The destruction of a large number of small solar and wind facilities will be more difficult than destruction of a small number of large power plants. In the event of a failure in one facility, electricity continues to be generated at the other facilities. [IEA \(2025\)](#) is very supportive of distributed solar and battery storage in Ukraine. Similarly, [Tröndle \(2024\)](#) suggest that it is possible to create an energy system where renewable energy is a much greater share of the energy mix in Ukraine. Based on his research, believes that renewable energy can play a role in providing energy security and long-term economic development. There are some issues with renewable energy, though for solar wind power. Risk of reliance on foreign technology and minerals is concern. The geopolitics of energy is not removed by renewable energy, as [Overland \(2019\)](#) explains. Ukraine must, therefore, have an energy policy of moderation. Renewable energy should be used in conjunction with nuclear, natural gas, energy storage, energy efficiency and high European connection.

European Integration & Ukraine's Energy Future

The process of European integration can contribute significantly to the energy security of Ukraine. Ukraine has already taken a step closer to the European energy institutions and energy markets. Moreover, the EU has established Ukraine Facility, offering financial assistance of up to €50 billion to Ukraine for 2024-2027. The facility is intended for recovery, reconstruction, innovation, reforms

and Ukraine's path towards EU membership ([European Commission, 2024](#)). This assistance could be used for reconstruction of key infrastructure and enhanced economic development in Ukraine. Technical knowledge and investments can come from European cooperation. Renewable energy, electricity networks, energy storage and energy-efficiency programs may be visited by European companies & financial institutions in Ukraine. European integration contributes both economically and in terms of security. It may both help Ukraine to draw in investments and also lessen its reliance on Russian energy.

Financing Post-War Reconstruction

One of the most challenging issues in the reconstruction of Ukraine will be financing. According to the latest World Bank assessment, Ukraine requires almost US\$588 billion to be allocated over 10 years ([World Bank, 2026](#)). This is much more than the Ukrainian government will be able to afford. This will be of great importance for international support. Financial support is possible from the European Union, World Bank, IMF, European Investment Bank, EBRD and others. The IMF has also stressed the need for external financial assistance to Ukraine's economic stability. The IMF noted that Ukraine's economy is still resilient but the war and energy infrastructure attacks are now very risky ([International Monetary Fund, 2024](#)). There also will be need for private investment. Investors might consider renewable energy, electricity distribution and transmission, battery storage, energy efficiency, gas transmission and distribution pipelines, and modern industries. But investors must have faith. Thus, effective laws, transparency, good governance, protection of property rights and institutions are needed in Ukraine. So, it is necessary to link reconstruction of energy with broader economic reform.

Future Security Risks

However, Ukraine may still be at risk of security threats even after war has ended. Military attacks, cyber-attacks, sabotage and other political and economic pressures can impact energy facilities. As energy systems become more reliant on digital technology, cyber security will become increasingly important factor. Computer systems are used in electricity networks, gas systems & control centers. Ukraine will thus require robust physical and electronic security for its energy assets. This will also require emergency systems. Communities may be able to operate their systems during a disruption to the electrical system by using backup generators, battery storage, mobile power units and local energy systems. The war experience has demonstrated the need to plan energy systems for normal and emergency use.

Policy Discussion

After the reconstruction should be used by Ukraine to change the energy system, the primary objective should be to develop a reliable, diversified, decentralized, and cost-effective system. More renewable energy resources, particularly distributed solar and wind, should be used in the country. It should also build-up battery storage and modern electricity networks. Recent IEA projects are consistent with this trend and suggest that decentralizing energy system can render Ukraine more resilient to attacks. (IEA) Furthermore, Ukraine needs to engage European Union in terms of energy cooperation. Electricity connections, investment and technology can be supplied from European markets. Ukraine also needs to not be overly reliant on single foreign state or technology producer.

Energy diversification shall cover diversification of suppliers, technologies, investments and other types of energy. The sanctions imposed upon the Russia should also be coordinated internationally. Sanctions evasion and alternative shipping and financial networks should be of special concern to the western countries.

FINDINGS & DISCUSSION

The first major discovery of this study is that the war between Russia and Ukraine has firmly placed energy as a pivotal element of Ukraine's economic security. Electricity and gas facilities have been damaged & disrupted resulting in impacts on businesses, households, industries and public services. The second is that energy sanctions are likely to limit Russian energy income, but they will not be enough to curb Russian energy exports. Russia has rallied from sanctions, refuted by diversification of trade and the discovery of other markets. The third is that Ukraine is in position to create a better energy system when it rebuilds. The system can be made stronger than before war by decentralized renewable energy, battery storage, modern electricity networks, energy efficiency and European integration. The war has also affected Europe's energy policy. Prior to full-scale attack, Europe was very reliant on Russian oil and gas products. The European Union began decreasing this reliance, implementing use of energy suppliers and renewable energy sources after 2022. The fourth is that international financial aid will be vital. It's not possible that Ukraine will rebuild its energy system on its own. Final conclusion is that reconstruction of energy should not be considered a technical project. It should be considered component of Ukraine's comprehensive economic, foreign & national security policies.

CONCLUSION

Energy security will become one of the key pillars of Ukraine's economic recovery in the future. The Russia – Ukraine war has demonstrated the fact that energy infrastructure is not just an economic resource, but an integral component of national security. The attacks on Ukrainian electricity, gas and heating infrastructure caused significant economic issues in Russia. They have cost businesses more, impacted households, lowered production and put pressure on government finances. Along with other sanctions, energy sanctions have turned into vital component of international measures against Russia. The impact of sanctions has been economic upon Russia, particularly because they decrease the profits that be made from selling its energy resources. Russia, however, has adjusted to some of sanctions in number of ways, including altering its energy markets and trading practices. This reveals need for real international cooperation & enforcement of sanctions. The reconstruction period is an important opportunity for Ukraine in the future. Ukraine shouldn't just restore the old energy system. It should develop a decentralized, diversified modern, renewable, interconnected system with Europe.

Energy security can be enhanced through distributed electricity generation, wind power, battery storage, energy efficiency, modern electricity networks & enhanced infrastructure protection. Other current energy sources such as nuclear power can also help to achieve a balanced energy system. Foreign help will be required. The EU, World Bank, IMF and private investors can finance, provide technology and expertise for reconstruction. Finally, Ukraine's energy future is intricately linked to

its economic future. A robust energy system enables businesses, industries and support employment, investment and public services. It can also lessen Ukraine's reliance on the rest of the world for its energy needs and shield them from future political pressure. Thus, the reconstruction of the energy sector of Ukraine should not be considered only the replacement of the destroyed buildings and power plants. It is to be considered as a chance for strengthening, safe, modern and economically prosperous Ukraine.

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