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The EU's Energy Crisis: Shifting from Fossil Fuels to Renewable Solutions Amid Geopolitical Tensions

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Abstract
The European Union (EU) has faced a profound energy crisis between 2020 and 2024, driven by post-pandemic economic recovery, surging energy demand, and geopolitical tensions, particularly the Russia-Ukraine conflict. This article explores the multifaceted nature of the crisis, analyzing the EU's strategic responses, including energy diversification, renewable energy adoption, and policy reforms. Using a mixed-methods approach, this study evaluates the effectiveness of these strategies and their implications for achieving long-term energy resilience. The findings underscore the need for comprehensive and inclusive energy policies that balance sustainability with security. The European union (EU) faces a complex energy crisis with roots in the COVID 19 pandemic, the disruption in global energy prices in the post Covid period and exacerbated by the war in Ukraine. These crises disrupt the EU energy markets highlighting the need for more sustainable and secure energy future. Rapid post-pandemic economic recovery led to a concomitant surge in energy demand, exceeding producers' existing capacity. The EU heavy reliance on the Russian gas imports exposed vulnerabilities, prompting the EU to implement a multi-pronged strategy to ensure energy security and High energy prices, geo-political uncertainty, renewables integration and social impact remains to be the biggest challenges.
This article explores the crisis's multifaceted origins, ranging from pandemic-induced demand slumps to geopolitical tensions with Russia amid the Ukraine war. It also will analyse the strategies adopted by the EU to address the crisis, including diversification of energy sources, energy efficiency measures, and fostering renewable energy development. The article concludes by discussing the long-term implications for the EU's energy security and the need for a comprehensive energy transition plan.

Keywords: European Union, Energy Crisis, Energy Security, Energy Diversification, Energy Efficiency

Introduction

The European Union (EU) faced unprecedented challenges in its energy sector from 2020 to 2024, as the confluence of post-pandemic recovery and geopolitical upheaval exposed systemic vulnerabilities. The energy crisis manifested through supply disruptions, soaring prices, and renewed urgency for a sustainable energy transition.

This article aims to analyze the EU's strategies in mitigating the energy crisis, focusing on their effectiveness, limitations, and long-term implications. Through a mixed-methods approach grounded in resilience theory and geopolitics, this study evaluates the EU's response in achieving energy security while navigating the complexities of global energy markets. The central research question asks: *How has the EU addressed the energy crisis, and what lessons can be drawn for future resilience in energy policy?*

Energy security has emerged as a critical challenge for the EU, reflecting the interplay of economic vulnerabilities, geopolitical dependencies, and environmental imperatives. The convergence of post-pandemic demand surges and the disruption of Russian gas supplies during the Ukraine conflict exposed structural weaknesses in the EU's energy framework. This article seeks to critically analyze the EU's responses to the energy crisis from 2020 to 2024, assessing their efficacy and limitations within a broader theoretical and geopolitical context.

The research question guiding this analysis is: *To what extent have the EU's strategies mitigated the energy crisis while promoting long-term energy resilience?* Employing a geopolitical lens and resilience theory, this study evaluates the EU's transition towards a sustainable energy future, focusing on key policy initiatives, technological integration, and market

diversification efforts.

The European Union (EU) has encountered formidable challenges in its energy landscape during the period spanning from 2020 to 2024. Amidst the tumultuous impacts of the COVID-19 pandemic and broader geopolitical shifts, the EU has faced a pressing need to address its energy crisis. This crisis has manifested in various forms, including supply disruptions, rising energy prices, and the imperative to transition towards sustainable energy sources. In response, the EU has formulated strategies aimed at mitigating these challenges and steering the region towards a more resilient and sustainable energy future. This article aims to examine and analyze the strategies implemented by the EU to tackle the energy crisis during the specified period, evaluating their effectiveness, limitations, and implications.

The purpose of this study is to provide a comprehensive analysis of the European Union's strategies for mitigating the energy crisis from 2020 to 2024. By examining the policies, initiatives, and actions undertaken by the EU in response to the energy challenges faced during this period, this research seeks to elucidate the key factors influencing the region's energy resilience and sustainability. Furthermore, this study aims to contribute to the existing body of knowledge on energy policy and governance, offering insights into the evolving dynamics of energy security and transition in the EU context.

The Object of the study is energy crisis in the EU from 2020-2024. The subject of the study is the effectiveness of the strategies, policies, and initiatives implemented by the EU to address the energy crisis and enhance energy resilience during this period.

The hypothesis of the study is that the European Union's strategic measures to address the energy crisis from 2020 to 2024—including diversification of energy sources, integration of renewable technologies, and targeted policy reforms—will significantly enhance the region's energy resilience, sustainability, and affordability. However, it is further hypothesized that these measures will face critical challenges, such as uneven implementation across member states, technological and infrastructural constraints, and geopolitical pressures. While progress is anticipated in reducing reliance on Russian energy, the effectiveness of these strategies is likely to be moderated by the EU's fragmented energy governance and the financial demands of transitioning to renewables.

An energy crisis is a situation where there's a significant imbalance between the supply and demand for energy resources. An energy crisis is defined as any significant shortage in energy supply to a country or region. Energy crises can be caused by a shortage of resources, disruptions to the supply chain, sudden upticks in demand, or sometimes all three.

The EU energy crisis wasn't a sudden event, but rather a culmination of factors. The COVID-19 pandemic caused a temporary drop in energy demand and prices due to lockdowns and travel restrictions. As economies reopened, global energy demand rebounded sharply. This, combined with supply chain disruptions and tensions between major oil producers, led to a gradual rise in energy prices. Russia Ukraine conflict significantly impacted the situation. Sanctions and a shift away from Russian energy sources caused a further surge in energy prices, marking a more acute phase of the crisis.

This study will adopt a qualitative research design, utilizing a mixed-methods approach to comprehensively examine the EU's strategies for mitigating the energy crisis. Qualitative methods will be employed to analyse policy documents, reports, and official statements from EU institutions and member states, providing insights into the formulation, implementation, and outcomes of energy-related policies and initiatives. Additionally, quantitative methods will be utilized to assess key performance indicators, such as energy consumption trends, renewable energy deployment, and carbon emissions reductions, to measure the effectiveness of EU strategies.

The Covid 19 and EU Energy crisis

The COVID-19 pandemic played a significant, indirect role in worsening the current energy crisis in the European Union. Lockdowns and economic slowdown during COVID led to a temporary decrease in energy demand across the EU. This, coupled with a global oil price war, resulted in a temporary drop in energy prices. However, this masked underlying vulnerabilities in the EU's energy system, particularly its dependence on fossil fuel imports, especially natural gas from Russia.

Throughout the pandemic, there existed a systemic disparity between demand and supply within the energy sector. In the European Union, these issues surged notably in September and even more so in December 2021. The supply and energy crises were inevitably accompanied by an inflation crisis, with the overall price level rising from under 2 percent to over 5 percent by the end of 2021. (Massetti & Exadaktylos, 2022, p. 6) [15].

Resilience theory provides a useful lens to understand these dynamics, emphasizing the importance of adaptive capacity in managing systemic disruptions. Resilience amidst an energy crisis refers to the ability to effectively manage disruptions in energy supply while ensuring the ongoing provision of affordable energy services to the community. (Erker *et al*., 2017) This includes implementing contingency plans, diversifying energy sources, maintaining critical energy services, ensuring affordability through subsidies and assistance programs, investing in resilient infrastructure and technology, fostering community engagement, and adapting policies to address evolving challenges in the energy landscape. The EU's initial measures—subsidizing affected industries and encouraging energy efficiency—showed partial success but failed to address deeper structural issues.

The COVID-19 pandemic significantly impacted the global energy landscape, serving as both a stress test and a catalyst for policy shifts within the European Union (EU). While initial lockdowns temporarily suppressed energy demand and lowered prices (Arezoo Ghazanfari, 2020) [1], the subsequent economic reopening in late 2021 revealed deep-seated vulnerabilities in the EU's energy system. The rapid rebound in energy demand, coupled with a cautious response from oil and gas producers following the price crash of 2020, created supply shortages and drove significant price hikes. This mismatch between supply and demand underscored a systemic underinvestment in fossil fuel exploration and production, influenced by concerns over peak oil and the global pivot toward renewable energy sources.

The pandemic not only highlighted these structural weaknesses but also exacerbated existing geopolitical tensions, particularly in major oil-producing regions such as the Middle East (Khan *et al*., 2022) [13]. Instability in these

regions disrupted production and transportation, further contributing to energy market volatility. Simultaneously, the EU's decarbonization agenda, emphasizing a transition from coal to natural gas, created short-term dependencies that strained the supply of gas, particularly as demand for cleaner energy alternatives surged. By 2021, these converging factors led to unprecedented energy price inflation, predating even the geopolitical shock of the Russia-Ukraine conflict (Mišík, 2022) [16].

Critically, while the pandemic period allowed renewable energy sources such as wind and solar to increase their share in the energy mix due to reduced competition from fossil fuels, this did not equate to a paradigm shift. The reduced reliance on non-renewable energy sources during lockdowns (Rokicki *et al*., 2023) [21] was more a function of decreased industrial activity and mobility rather than a structural transformation in energy policy. Nonetheless, these circumstances underscored the resilience potential of renewables and their capacity to stabilize energy systems in times of crisis.

The EU's response to these challenges reflected an evolving understanding of resilience, as seen in the establishment of the Recovery and Resilience Facility (RRF) under the NextGenerationEU (NGEU) initiative. Launched in February 2021, the RRF aimed to accelerate economic recovery while addressing structural disparities in renewable energy deployment across member states (Crnčec *et al*., 2023) [3]. However, the energy transition remained incomplete, with a lack of full integration into broader EU energy policies during this period (Crnčec *et al*., 2023) [3]. This gap limited the EU's ability to capitalize fully on the momentum generated by pandemic-induced shifts in energy demand.

Further advancements, such as the European Green Deal and national climate laws adopted in 2020, signaled a strong commitment to achieving carbon neutrality by 2050 (Fetting, 2020). These policies sought to rebuild the economy through investments in renewables, circular economic practices, and sustainable growth. While COVID-19 did not directly cause a shift in EU energy policy, it provided a unique opportunity for green energy solutions to gain prominence amid the recovery. The resulting framework, epitomized by the NGEU, represented a departure from traditional EU financial strategies, with shared debt mechanisms enabling investments in energy efficiency, modernized infrastructure, and innovation (Massetti & Exadaktylos, 2022) [15].

Empirical studies during the lockdown period further reinforced the potential of renewables. A comparative analysis across 16 European countries revealed that restrictions significantly reduced non-renewable energy consumption, particularly fossil fuels, while increasing reliance on wind and solar energy (Werth *et al*., 2021). These findings demonstrate that external shocks can accelerate transitions to cleaner energy systems, provided there is adequate policy support and investment. However, the EU's ability to sustain this momentum post-pandemic remains contingent on addressing systemic challenges, including regional disparities, infrastructural bottlenecks, and geopolitical risks.

In conclusion, the pandemic illuminated both the fragility and adaptability of the EU's energy system. While short-term policies mitigated immediate disruptions, achieving long-term energy resilience requires deeper structural reforms. The integration of renewable energy into the EU's broader strategy, alongside robust diversification efforts, will be critical in ensuring a sustainable and secure energy future.

Post-COVID Energy Dynamics

The recovery of global economies in 2021 exposed systemic vulnerabilities in energy markets as demand for energy surged faster than supply could adjust. This mismatch was particularly pronounced in Europe, where rising global Liquefied Natural Gas (LNG) prices and strained geopolitical relations with Russia significantly drove up natural gas prices (Kotek *et al*., 2023) [14]. These early warning signs were compounded by the outbreak of the Russia-Ukraine conflict in February 2022, which marked a turning point in the EU's energy landscape, further exacerbating concerns over supply disruptions.

Historically, the EU has relied heavily on Russian oil and gas imports, facilitated through critical infrastructure like the Nord Stream 1 pipeline (Cui, 2022) [4]. However, the geopolitical dynamics following the Ukraine invasion disrupted this dependency. Sanctions imposed on Russia and the resulting escalation in global energy prices introduced significant uncertainty to EU energy markets. In retaliation, Russia demanded payment for gas in rubles beginning in late March 2022, complicating transactions for European buyers accustomed to dealing in euros or dollars. By April 2022, gas supplies to certain European countries were significantly reduced, with Russia attributing these disruptions to sanctions and technical difficulties. These developments intensified oil and gas price volatility within the EU (Olayungbo *et al*., 2024) [17].

From the EU's perspective, Russia's actions represented a deliberate political maneuver to leverage energy supplies as a geopolitical weapon. Conversely, Russia argued that sanctions impeded its ability to maintain consistent supplies, underscoring the interdependence and fragility of the EU-Russia energy relationship. As gas flows from Russia to Europe dwindled to unprecedented lows, albeit not entirely halted, the EU faced an urgent need to reduce reliance on Russian imports. However, the long-term trajectory of this energy relationship remains uncertain, contingent on both the geopolitical evolution of the Ukraine conflict and the capacity of the EU to sustain alternative arrangements.

In response, the EU accelerated its efforts to diversify energy sources and suppliers. Initiatives to increase LNG imports from countries such as the United States and Qatar and to invest in renewable energy sources became central to this strategy. While these measures marked a significant shift in the EU's approach to energy security, achieving meaningful diversification has proven uneven across member states. Some countries demonstrated considerable progress in reducing dependency on Russian energy, whereas others, constrained by infrastructural and economic disparities, lagged behind (Streimikiene *et al*., 2023) [22].

These dynamics underscore the structural challenges the EU faces in balancing energy security with sustainability goals. On the one hand, the diversification of suppliers is a pragmatic response to immediate supply risks. On the other, reliance on LNG presents its own vulnerabilities, including price volatility and environmental concerns. Similarly, investments in renewables require substantial financial and technological resources, which are unevenly distributed across the EU. Addressing these imbalances will be critical

to fostering a cohesive and resilient energy system in the post-COVID era.

The Energy Security Problem

While the EU is both an importer and producer of energy, its energy system remains heavily reliant on imports. As of 2024, more than 40% of the EU's energy production comes from renewable sources, and around 30% is derived from nuclear energy (European Council, 2024) [7]. However, fossil fuels, particularly natural gas from Russia, played a dominant role in meeting the EU's energy demands prior to the Russia-Ukraine conflict. In the years leading up to the conflict, the EU's imports of natural gas from Russia had been increasing, driven in part by rising oil prices within the EU itself (Eurostat, 2024) [9].

This growing dependence on Russian natural gas became a strategic vulnerability. The Russian Ukraine conflict in February 2022 exacerbated these concerns, with the EU condemning the invasion as an "unprovoked" act of aggression and accusing Russia of weaponizing its energy supply (European Council, 2024) [7]. This shift in geopolitical dynamics raised alarms about the security of energy imports from Russia, as the EU grappled with the implications of relying on a supplier now viewed as politically and economically hostile.

In response, the EU swiftly moved to reduce its dependency on Russian fossil fuels, signaling a commitment to transitioning towards cleaner energy alternatives. This shift was framed as both an environmental and geopolitical necessity, aimed at achieving greater energy security by diversifying sources of supply and accelerating the transition to renewables (Eurostat, 2024) [9].

The ongoing conflict in Ukraine has intensified the EU's reliance on energy imports, primarily driven by the need to bolster strategic reserves and mitigate the risks of future disruptions in global energy markets (Rokicki *et al*., 2023) [21]. The EU's diversification strategy, therefore, has been twofold: First, to reduce its dependence on Russian energy by increasing imports from alternative suppliers, and second, to decrease its overall reliance on fossil fuels by promoting renewable energy adoption and energy efficiency.

Following the conflict's escalation, the EU implemented a series of restrictive measures targeting imports of Russian natural gas, coal, and petroleum oil, aiming to sever economic ties with its former primary energy supplier (Eurostat, 2024) [9]. While these actions were necessary from a political and security standpoint, they also underscored the complexity of the EU's energy transition, balancing immediate security needs with long-term sustainability goals.

This energy security crisis has exposed significant gaps in the EU's energy strategy, particularly regarding the ability of different member states to transition away from fossil fuels at an equal pace. Some states have made considerable progress in diversifying their energy supplies and investing in renewables, while others remain heavily reliant on fossil fuel imports, creating internal tensions within the EU's broader energy framework.

The Energy Crisis Effect in Europe

The ongoing energy crisis has underscored the urgent need for comprehensive and sustainable energy policies to pre-empt future disruptions. Prior to 2020, the EU's energy policies aimed at achieving greater energy independence, but these efforts fell short. Despite notable initiatives focused on energy efficiency and low-carbon technologies, the EU continued to depend heavily on external energy sources, particularly fossil fuels, which exposed the bloc to significant risks during crises (Rokicki *et al*., 2023) [21]. This reliance on external suppliers, especially for natural gas, intensified the vulnerabilities faced by the EU as global energy markets became increasingly volatile.

By 2022, energy prices surged to historic highs, severely affecting households and businesses across Europe. This dramatic price increase called for urgent action, as the EU sought to mitigate the social and economic impacts of the crisis. The EU recognized that a collective, unified approach was essential to addressing the crisis, particularly for states that were heavily dependent on Russian energy supplies. In March 2022, the International Energy Agency (IEA) proposed a 10-point plan to reduce the EU's dependence on Russian energy (IEA, 2022) [12]. This recommendation was swiftly followed by the adoption of the REPowerEU plan in May 2022, designed to accelerate the transition away from Russian fossil fuels and toward more diversified and sustainable energy sources (REPowerEU, 2022) [19].

The objectives of REPowerEU were clear and ambitious: *Save energy, produce clean energy, and diversify energy sources*. To address the immediate impacts of soaring energy prices, the European Council also enacted an Emergency Regulation in October 2022, aiming to reduce energy consumption across the EU. This regulation included measures to cut electricity use, cap revenues of electricity producers, and secure solidarity from fossil fuel businesses. Financial incentives were introduced to support companies that reduced their energy consumption and those investing in clean energy (Energy Crisis, 2024).

A year after the implementation of REPowerEU, the EU reported significant progress: It reduced its dependency on Russian energy by nearly 20%, introduced a gas price cap and global oil price cap, and doubled its renewable energy deployment. These actions helped alleviate the worst effects of the energy shortages that might have otherwise escalated if REPowerEU had not been enacted (REPowerEU, 2022) [19].

In addition to these measures, EU member states took proactive steps to decrease demand for Russian gas and boost investments in green technologies, aligning with broader climate goals to achieve both energy security and sustainability (Farghali *et al*., 2023) [10]. Initiatives implemented prior to the crisis, such as investments in wind and solar energy, laid the groundwork for reducing carbon emissions and diversifying the EU's energy mix. The Renewable Energy Directive, first adopted in 2009, has played a key role in this transition, with increasing focus on renewables over the past decade (Renewable Energy Directive, 2009) [18].

The EU's diversification strategy has been marked by rapid changes. While investments in infrastructure like LNG terminals and pipelines are necessary for a sustained shift, the EU has been quick to reduce its reliance on Russian gas imports. In particular, the US has become the largest supplier of LNG to Europe, replacing Russia. From 2019 to 2023, LNG imports increased from 20% to 40%, demonstrating the EU's concerted efforts to fill the energy gap with supplies from alternative sources like the US and Norway (The European Union-Russia Energy Divorce,

2024). This shift away from Russian gas was made possible by the EU's growing LNG capacity and more strategic sourcing, with Norway emerging as the largest pipeline gas exporter to the EU.

In 2023, the EU's total pipeline gas imports from Russia had plummeted to around 8%, a stark decline from the 40% share in 2021. By 2024, the EU plans to completely halt fossil fuel imports from Russia by 2027 (The European Council, 2024) [23]. However, this shift also required significant reductions in gas consumption within the EU to cope with the shortfall. The transition to alternative sources, while crucial, remains a complex process that requires extensive infrastructure investment and political coordination among member states.

The EU's energy subsidies have also played a pivotal role in mitigating the effects of the crisis. These subsidies were introduced as part of national measures aimed at protecting consumers from the sharp increase in energy prices during 2021-2022. Despite these efforts, European countries continue to face economic and social challenges, with the energy crisis revealing deep inequalities in the region's energy systems (Zhang Xinmin & Zhang Jing, 2023) [24]. The EU's response to the crisis, while effective in some respects, underscores the need for a more comprehensive, long-term energy strategy that balances sustainability with resilience to external shocks.

Renewable Energy

The European Union (EU) has long faced limitations in its domestic reserves of fossil fuels, such as oil and natural gas. As a result, the EU began contemplating the gradual transition to renewable energy sources as early as the 1990s. In 1997, the EU set a target of achieving 20% renewable energy in its energy mix by 2010, a goal which was part of broader strategic efforts to reduce dependence on fossil fuels and mitigate environmental impacts (Renewable Energy Directive, 2009) [18]. Since then, renewable energy has become an increasingly important component of the EU's energy mix, as the bloc seeks to diversify its sources and enhance energy security.

The EU has set ambitious targets to increase the share of renewable energy in its final energy consumption. These goals are not only driven by the need to reduce greenhouse gas emissions but also to bolster energy security by reducing dependence on external energy sources. In 2022, the EU achieved a historic milestone, with the use of renewable energy from wind and solar sources surpassing fossil fuel consumption for the first time in the Union's history, by a margin of 2% (European Electricity Review, 2023). This shift highlights the accelerating pace of the transition, fueled in part by the geopolitical instability arising from the Russia-Ukraine conflict, which further underscored the need for energy diversification.

By the same year, renewable sources accounted for around 23% of the EU's gross final energy consumption, representing a steady increase from previous years. The EU is on track to meet its 2030 target of at least 42.5% renewable energy, with the potential for even higher achievements, given current trends in renewable energy development (Eurostat, 2024) [9]. Wind and solar power were the leading sources of renewable energy in 2022, together accounting for over half of the total renewable energy generation. Biomass, hydropower, and geothermal energy also made significant contributions to the energy mix.

The adoption of renewable energy in the EU brings multiple benefits. It contributes significantly to the reduction of greenhouse gas emissions and air pollution, which aligns with the EU's climate goals. Additionally, it enhances energy security by reducing reliance on imported fossil fuels and helps create jobs in the clean energy sector. These benefits have catalyzed public and political support for renewable energy, with many citizens viewing it as a crucial solution to both climate change and air quality improvement.

A key element of the EU's renewable energy strategy is the Renewable Energy Directive, which sets binding targets for member states to increase their share of renewables in the energy mix. In late 2023, the EU updated this directive, reinforcing its commitment to clean energy. The new mandatory target is for the EU to reach at least 42.5% renewable energy by 2030, with an ambition to push this figure to 45% (Revised Renewable Energy Directive, 2023) [20]. This revision reflects the EU's increasing determination to meet both climate change and energy security goals, aligning with the Union's broader Green Deal strategy.

The cost of renewable energy technologies, such as wind turbines and solar panels, has decreased significantly in recent years, making renewables more economically competitive with traditional fossil fuels. This reduction in costs, coupled with increasing public support for clean energy, has positioned the EU to continue its transition to renewables. However, the integration of renewable energy into the EU's energy system is not without its challenges. Renewable sources like solar and wind are intermittent, meaning they do not produce energy consistently, which complicates their integration into the grid. To address this, significant investments are needed in energy storage technologies and grid modernization to ensure the stable supply of electricity.

Additionally, local opposition to renewable energy projects, particularly wind farms, remains an obstacle. Concerns about noise and the visual impact of wind turbines often lead to resistance in certain communities, which can delay the deployment of renewable infrastructure. Despite these challenges, the EU remains well-positioned to meet its renewable energy targets. The ongoing decline in the cost of renewable technologies, combined with a strong policy framework and continued investment, will enable the EU to overcome these hurdles and advance towards a sustainable, energy-secure future.

Conclusion

The European Union's energy crisis, which became more pronounced following the Russia-Ukraine conflict, has exposed the structural vulnerabilities in the EU's energy security framework. While the EU has been gradually transitioning away from fossil fuels due to its limited domestic reserves and dependence on external suppliers, particularly Russia, this transition has not been sufficient to fully mitigate the risks associated with external energy dependencies. As a result, the EU's reliance on Russian natural gas, oil, and coal, combined with geopolitical instability, created significant energy security challenges.

In response, the EU adopted several strategic measures, including the REPowerEU plan, which aims to accelerate the diversification of energy sources, reduce reliance on Russian energy, and expand renewable energy use. This

plan has shown some positive outcomes, with renewable energy consumption surpassing fossil fuel use for the first time in 2022, and the EU making notable progress toward its 2030 renewable energy targets. However, challenges remain in terms of integrating intermittent renewable sources like wind and solar power, overcoming infrastructural bottlenecks, and addressing the disparity in energy capabilities across different EU member states.

The EU's efforts to transition to a more sustainable and secure energy future are ongoing. The long-term success of these initiatives depends on continued investment in renewable energy infrastructure, energy storage, and grid modernization, as well as on achieving greater cooperation and solidarity among member states. While the EU has made strides toward energy diversification, the crisis has underscored the need for a more resilient and integrated energy system that can better withstand future geopolitical and economic disruptions.

References

1. Arezoo Ghazanfari. The Impact of the COVID-19 Pandemic and Crude Oil Price Crisis on the Price of Automobile Fuels in European Countries. 2020; 2(6).
2. Bruegel. Bruegel | The Brussels-Based Economic Think Tank, February 19, 2024. https://www.bruegel.org/analysis/european-union-russia-energy-divorce-state-play
3. Crnčec D, Penca J, Lovec M. The COVID-19 pandemic and the EU: From a sustainable energy transition to a green transition? Energy Policy. 2023; 175:113453. Doi: https://doi.org/10.1016/j.enpol.2023.113453
4. Cui L. The European energy crisis of 2022 in the context of increasing sanctions pressure on the russian federation: Analysis of economic losses and scenarios. European Chronicle. 2022; 7(3):19-29. Doi: https://doi.org/10.59430/euch/3.2022.19
5. de la Porte C, Jensen MD. The next generation EU: An analysis of the dimensions of conflict behind the deal. Social Policy & Administration. 2021; 55(2):388-402. Doi: https://doi.org/10.1111/spol.12709
6. EC, Infographics, January 17, 2024. https://www.consilium.europa.eu/en/infographics/eu-measures-to-cut-down-energy-bills/
7. European Council, February 2, 2024. https://www.consilium.europa.eu/en/infographics/where-does-the-eu-s-energy-come-from/
8. European Electricity Review. Ember, January 31, 2023. https://ember-climate.org/insights/research/european-electricity-review-2023/
9. Eurostat, 2024, n.d. Retrieved March 13, 2024, from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_trade_with_Russia_-_latest_developments
10. Farghali M, Osman AI, Mohamed IMA, Chen Z, Chen L, Ihara I, Yap P-S, *et al*. Strategies to save energy in the context of the energy crisis: A review. Environmental Chemistry Letters. 2023; 21(4):2003-2039. Doi: https://doi.org/10.1007/s10311-023-01591-5
11. Fetting, 2020. The European Green Deal, n.d.
12. IEA, 2022, n.d. Retrieved May 16, 2024, from: https://www.iea.org/events/a-10-point-plan-to-reduce-the-european-union-s-reliance-on-russian-natural-gas
13. Khan K, Su C-W, Zhu MN. Examining the behaviour of energy prices to COVID-19 uncertainty: A quantile on quantile approach. Energy. 2022; 239:122430. Doi: https://doi.org/10.1016/j.energy.2021.122430
14. Kotek P, Selei A, Takácsné Tóth B, Felsmann B. What can the EU do to address the high natural gas prices? Energy Policy. 2023; 173:113312. Doi: https://doi.org/10.1016/j.enpol.2022.113312
15. Massetti E, Exadaktylos T. From Crisis to Crisis: The EU in between the Covid, Energy and Inflation Crises (and War). JCMS: Journal of Common Market Studies. 2022; 60(S1):5-11. Doi: https://doi.org/10.1111/jcms.13435
16. Mišík M. The EU needs to improve its external energy security. Energy Policy. 2022; 165:112930. Doi: https://doi.org/10.1016/j.enpol.2022.112930
17. Olayungbo DO, Zhuparova A, Al-Faryan MAS, Ojo MS. Global oil price and stock markets in oil exporting and European countries: Evidence during the Covid-19 and the Russia-Ukraine war. Research in Globalization. 2024; 8:100199. Doi: https://doi.org/10.1016/j.resglo.2024.100199
18. Renewable Energy Directive. 2009, n.d. Retrieved April 27, 2024, from: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en
19. REPowerEU. 2022, n.d. Retrieved May 16, 2024, from: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en
20. Revised Renewable Energy Directive. 2023, n.d. Retrieved April 27, 2024, from: https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en
21. Rokicki T, Bórawski P, Szeberényi A. The Impact of the 2020–2022 Crises on EU Countries' Independence from Energy Imports, Particularly from Russia. Energies. 2023; 16(18):6629. Doi: https://doi.org/10.3390/en16186629
22. Streimikiene D, Siksnelyte-Butkiene I, Lekavicius V. Energy Diversification and Security in the EU: Comparative Assessment in Different EU Regions. Economies. 2023; 11(3):Article 3. Doi: https://doi.org/10.3390/economies11030083
23. The European Council, March 8, 2024. https://www.consilium.europa.eu/en/infographics/eu-gas-supply/
24. Zhang Xinmin, Zhang Jing. The European Energy Crisis and its Implications. The Frontiers of Society, Science and Technology. 2023; 5(12). Doi: https://doi.org/10.25236/FSST.2023.051207