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Energy security of economic systems in the context of global challenges: problems and consequences

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Abstract. The article reviews the global energy crises of the 1970s, 2021, and 2022 in the context of the economic systems energy security. The methodological basis of the research was general scientific and historical methods of the information analysis and assessment: generalization, data analysis and synthesis, logical and comparative analysis. The paper highlights and systematizes specific measures taken by countries to offset the consequences of energy crises, analyzes the effectiveness of these measures in the context of the economic systems energy security. The article also dwells on the causes and course of crises, highlights their common features, features, and differences. The study revealed that a combination of factors such as recovery from COVID, depletion of fossil fuel energy reserves and extreme weather conditions cause a sharp increase in global energy demand. The results of the study can be used as elements for the development of an energy security strategy.

Keywords: global challenges, energy crises, economic systems, energy security.

JEL codes: L16, L71, O13

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Introduction

The modern stage of the world economy development, individual economic systems development highlights the issues of energy security of the world economic system at all levels – international, national, and regional (local). Moreover, the importance of solving the energy supply problem is increasing as global challenges are intensifying their impact on economic systems at various levels.

Issues of access to energy resources to ensure economic growth and meet the needs of the growing world population, changing the structure of the existing fuels use, and the threat of climate change are on the agenda of most international organizations and governments of the largest world countries. The recent global trends in energy and trade provide the unprecedented opportunities for economic growth and sustainable development of national economies in the context of global instability. At the same time, there are also significant threats in the context of energy security. They threat to some countries sustainable development and economic growth.

The purpose of the research is to study the theoretical foundations and develop practical recommendations on economic systems energy security in the global challenges.

Main part

Nowadays, energy crises are one of the most influential global challenges. Since the end of the last century, these problems have been escalating (Fig. 1).

The world is experiencing sharp price increases for all energy sources: gasoline, natural gas, and coal. According to the analysis of many experts in the field of energy market development, the forecast is unfavourable one. There is a well-founded concern on Ukrainian crisis, characterising by the years of

insufficient investment in the energy sector, has led to the world crisis. It could surpass the oil crises of the 1970s and early 1980s. Moreover, the energy crisis of 2021-2022 is not concern with oil only. Therefore, there is a need to analyze the energy crisis of the 70s of XX century.

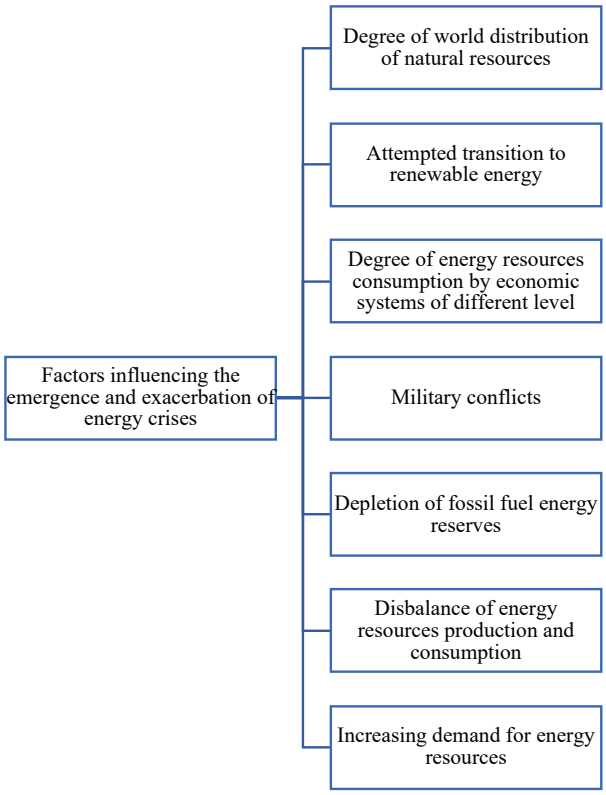

Figure 1 Factors influencing the emergence and exacerbation of energy crises
Source: composed by the authors

There are some obvious correlations between the crisis of the 70s and the modern one: gasoline prices are high, oil supplies are limited, and President Joe Biden, like former Democratic President Jimmy Carter, is under political pressure, etc. In addition, in the 70s, OPEC countries decided to ban oil supplies to the United States and other countries supporting Western policies (the UK, Japan, Canada, the Netherlands) to limit with military supplies to the United States – Israel in the conflict with Syria and Egypt. Currently, due to the military conflict in Ukraine within the framework of the OPEC+ agreement, the countries decided to reduce oil production. It will significantly increase the cost of energy resources, hence dealing a serious strike to the US, the EU, and their allies.

However, there are significant differences between today's crisis and that of 1970s. Today, oil prices are not under regulation, and the supply crisis raises the prices. It is mostly in accordance with the political situation. Also, interest rates and inflation rates are still significantly lower than they were decades ago.

There is also major element in today's crisis that was less noticeable in the 1970s: irreversible climate change combined with a liberal claim to abandon dependence on fossil fuels. Indeed, they significantly influenced on the transformation of energy systems in many countries. Therefore, the green agenda is extremely beneficial for Oil and Gas Companies working in the field of production and maintenance of equipment and infrastructure for the green economy project implementation. At the same time, it is extremely unprofitable for both national economies and energy-dependent industrial enterprises in energy-deficient countries.

In addition, the catalyst for today's crisis was a combination of the following factors: recovery after COVID-19, depletion of energy reserves of fossil fuels, extreme weather conditions causing a sharp increase in global energy demand, the military conflict in Ukraine[1].

Obviously, the 1970s were a turning point for power engineering. The political actions in the United

[1] *Carita, F. A perfect storm: understanding the European energy crisis. LevelTen Energy. Available at: https://www.leveltenenergy.com/post/europe-energy-crisis (accessed 17.10.2022)*

States, following the Arab oil embargo in 1973 and 1974, the Iranian Revolution in 1978 and 1979, formed the world. For instance, they helped introduce a 55-mph speed limit. Moreover, the energy revolution of the 1970s was not rapid one. Many challenges, such as rising energy prices, last during three presidential administrations, and their struggle has affected those authorities' political careers. The 1973 oil crisis was characterised by the long queues at gas stations, fuel shortages and panic (which, however, is very typical for the energy crisis of 2021-2022).

Fifty years later, a new energy crisis ensues, following the embargo on Russian crude oil. Negative transformation processes followed the inflated energy prices due to a post-crisis global supply shortage. Also, the situation tends to get worse. Meanwhile, European leaders are in a controversial position: there are merits of cutting oil and gas dollars and demanded Russian energy. Large TNCs are relocating their business from Europe to countries with lower energy prices, which will negatively affect the economic security of European countries.

As it was decades ago, these dynamic changes may determine energy policy for many years. In the United States, the oil crisis offers the country two options: abandoning fossil fuels or increasing oil dependence. However, at this stage there is a more interesting competition in the world between oil, gas, hydrogen, renewable energy sources, etc. The 1970s ensured the energy development for the last 50 years. Nowadays, there is kind the same situation but the less predictable one (Marchant & Chainey, 2022).

The US oil market was already under stress due to restrictions on the foreign oil import when crude oil price controls were introduced in 1971 to reduce the cost of everyday gasoline purchases by Americans. Price controls cause a shortage of gasoline and the Arab oil embargo. The crisis starts one of the greatest problems: rapid inflation.

No U.S. president has been affected by the oil crisis of the 1970s, perhaps as much as Carter, who lost his bid for re-election in 1980. Carter has taken several actions in response to energy instability in the long term. He claimed Americans to save energy by advising people to wear a sweater rather than turn the thermostat and installing solar panels in the White House. He also established the Ministry of Energy and invested in research and development of alternative energy sources, such as solar.

There is a feature of the energy crisis of 2021-2022, which is very different from the 1970s – it was partially created by the United States. The sanctions restrictions on the purchase of Russian oil were an attempt to weaken Russia by reducing its oil revenues. It was popular among both Democrats and Republicans in Congress, even though it meant the voluntary withdrawal of additional global supplies at a period of already inflated energy prices. Indeed, it distinguishes it from the Arab oil embargo, which aggravated the energy crisis of the 70s, when OPEC excluded America from oil supplies because of the USA supported Israel in its war with Egypt and Syria.

But the events of the 1970s can be interpreted in different ways. Modern politicians have tried to reduce energy costs, save their political careers, and get rid of dependence on foreign oil (Litvinov, 2021).

For today's politicians, economists, the message of a decade ago is that radical proposals can have long-term consequences and become popular, but they can also become political issues. This is a kind of dilemma that is being faced today about whether to strive to promote large energy and climate issues, or to move more gradually in terms of the energy policy. For example, in the 1970s, some decisions caused the opposite results – price control and resource allocation in the United States. The 1975 Corporate Average Fuel Economy Standards were introduced to improve the fuel efficiency of cars and trucks and represented the changes concerning the energy sector today.

Other long-term policy implications include the creation of agencies such as the Ministry of Energy, as well as the International Energy Agency, an attempt to balance OPEC with its system of member countries strategic reserves, and a new emphasis on data exchange to ensure greater transparency and research of oil markets. Moreover, in 1975, under Republican President Gerald Ford, the United States passed a law on the creation of its crude oil reserves as a buffer against manipulation of world crude oil reserves. It happened in the hope that the United States would never hold on to a barrel again due to an oil global shortage (Skorokhodova, 2015).

Before proceeding to the analysis of the current crisis in the energy sector, we consider the actions of various countries in the 70s (Table 1). In addition to creating strategic energy reserves and diversifying their imports from the following countries: the USSR, Mexico, Africa, and Southeast Asia, there were taken actions to develop their own energy production. The countries have also taken various political decisions to protect their energy security.

For example, France has reached an agreement with OPEC member states regarding long-term oil supplies. Japan began to support the Persian Gulf countries at the international level to ensure constant supplies. The United States and the United Kingdom made the efforts towards establishing cooperation with the countries of the Persian Gulf. The United Kingdom and the Persian Gulf countries worked according to a special scheme. According to it, petrodollars went to London, in turn, British firms began to expand their industrial activities in Saudi Arabia. Also, the arms supply there began. 3 months after the lifting of the embargo, the United States and Saudi Arabia signed an agreement on economic cooperation and arms supplies, and the investment of Arab countries in US assets also began.

In addition, they joined forces to fight communism. There is an issue of relevance of today's energy crisis against the similar previous ones, especially the oil shocks of the 1970s. This issue appears all over the world when consumers are suffering from high prices, businesses are concerned about energy supplies, political leaders and bankers are struggling with inflation, and countries are facing pressure on the balance of payments, and all this is accompanied by a military conflict in Ukraine.

Table 1 – Actions of countries to offset the 1970s energy crisis consequences

France	The UK	Japan	Germany	The USA
France emphasized the production of its own elec-tricity through nuclear power (Messmer plan)	Accelerating domestic production of oil and gas in the North Sea	Increased investment in energy production (solar and nuclear power), which utilised domestically produced technologies. A forced measure was the increase in coal and LNG imports.	Diversification of energy re-sources import from the USSR and Norway. Development of nuclear energy industry. In-crease in the investments into energy sav-ing	Control of energy prices. Creation of the Strategic Petroleum Reserve and the Department of Energy within the government. Increasing investments in new technologies and alternative energy sources.
Results				
increase in the production of its own nucle-ar energy from 8 % in 1973 to 75 % in 1990.	reduced dependence on foreign energy imports; 80 % self-sufficiency in electricity needs by early 1980s; increase in do-mestic oil and gas production from 4.5 % in the early 1970s to 42 % in 1978.	- increased exports of cars; - competitiveness in the foreign car markets (the UK and the USA).	- increase in the market share of petrol, diesel, fuel oil produced in Germany to 50% by the mid-1970s; - reduced dependence on imports of energy products from Poland and the USSR.	- price control prevented an increase in own production; - mixed investment results: investments in nuclear power and shale gas production. At the same time, investments in synthetic fuels failed

Source: composed by the authors

In fact, today's crisis is potentially more destructive, and its consequences are even more negative. In the 1970s, it concerns with oil only, whereas the current crisis covers natural gas, coal and even the nuclear fuel cycle areas. One of the factors which could mitigate the crisis is price changes and consumer reaction.

In addition to inflation, today's crisis is turning the previously global market into a fragmented and more vulnerable to disruptions, which is holding back economic growth. Moreover, together with the geopolitical crisis caused by the war in Ukraine, this further deepens the rivalry of the great powers in the world. Today's energy crisis did not begin with the aggravation of the crisis in Ukraine; it arises in 2021, when the demand for energy resources increased sharply as the world emerged from the COVID-19 pandemic. It was caused by the coal shortage in China, and sharply prices increasing. Then the global market prices on liquefied natural gas and oil increase. The process of transition to renewable energy sources (hereinafter referred to as RES) depleted the energy reserves of fossil fuels. It caused a deficit of energy. There has been a significant increase in energy demand, and this deficit cannot be filled at the expense of renewable energy. Therefore, the energy crisis emerged. The energy supply crisis in the UK and parts of Asia and Europe has shown how the energy transition can have a ripple effect for all segments of society.

Having analyzed the production and consumption of energy by the world's largest economies, it is advisable to note the imbalances occurrence in the energy production and consumption (Fig.2).

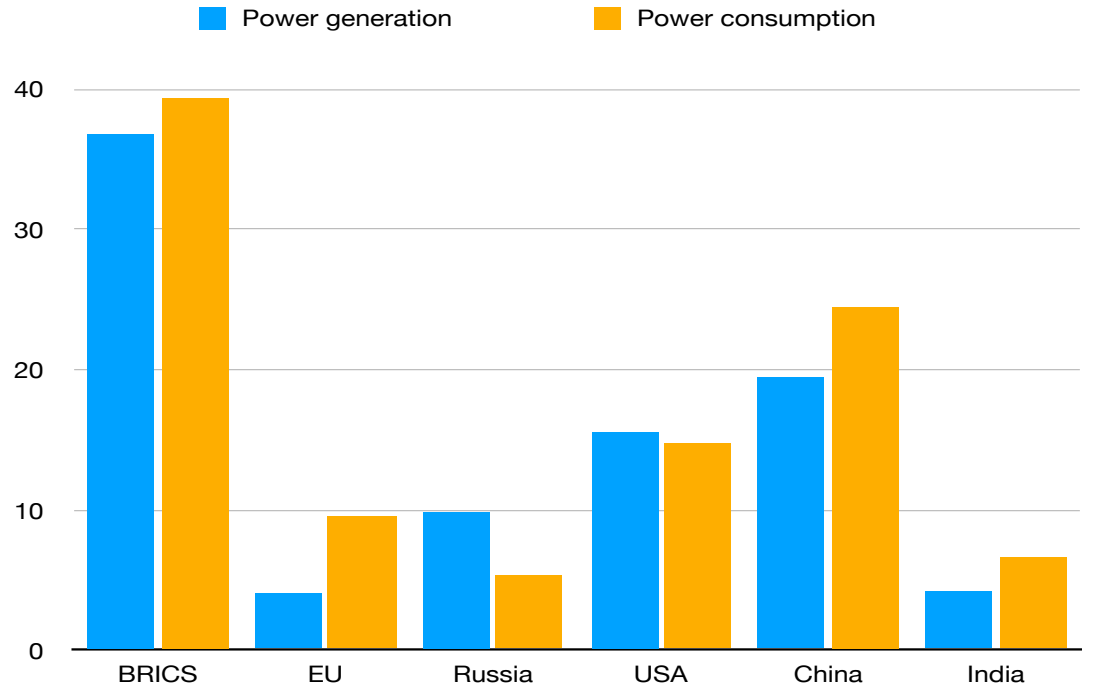

Figure 2. Total energy production and consumption in 2020, (mln tons of oil equivalent)
Source: compiled by the author according to https://www.enerdata.ru

Having analyzed the dynamics of the production of hard and brown coal in the EU, the Russian Federation, and the USA for the period from 1990 to 2020, (Fig. 3) it is advisable to note the downward trend occurrence in the USA and EU. In the context of the active development of the "green economy", it is quite reasonable.

In addition, analyzing the dynamics of changes in the trade balance of natural gas and LNG (Fig. 4), the Russian Federation has significant surpluses of natural gas, while European countries have a significant gas deficit, which has an extremely negative impact on energy security.

Analyzing the crude oil trade balance for the same period, the United States, as well as the EU countries, require crude oil imports, while the Russian Federation and Saudi Arabia have a negative trade balance and have the opportunity to export oil to other countries (Fig.5).

In 2022, the energy policy of the EU and the United States has changed dramatically towards strict protectionism. The start was the beginning of the SMO in Ukraine. All the adopted packages of sanctions against the Russian Federation had a sharply negative impact on the energy security of both EU countries and

individual enterprises and households.

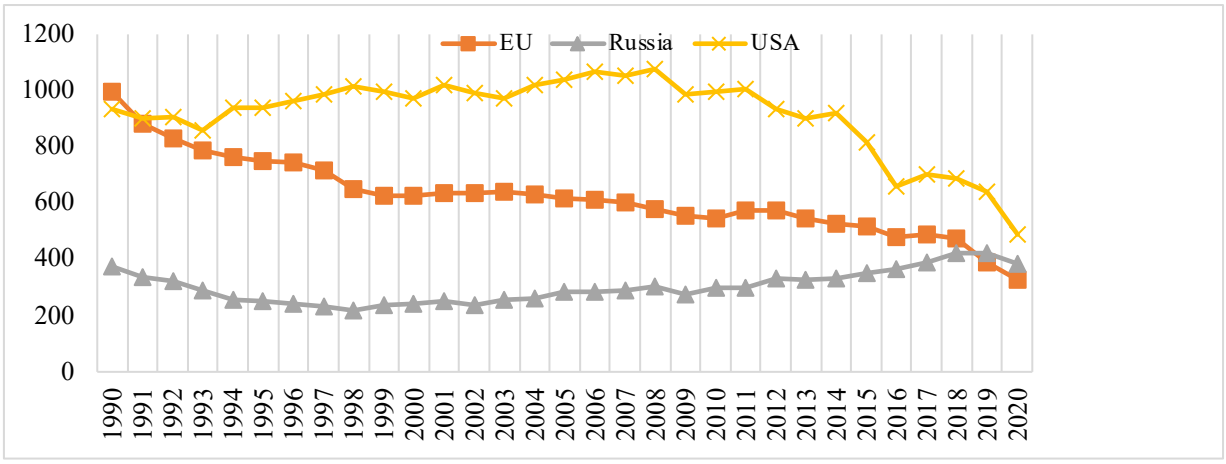

Figure 3. Dynamics of production of hard and brown coal in the EU, the Russian Federation, and the USA, 1990 - 2020, mln tons

Source: https://www.enerdata.ru

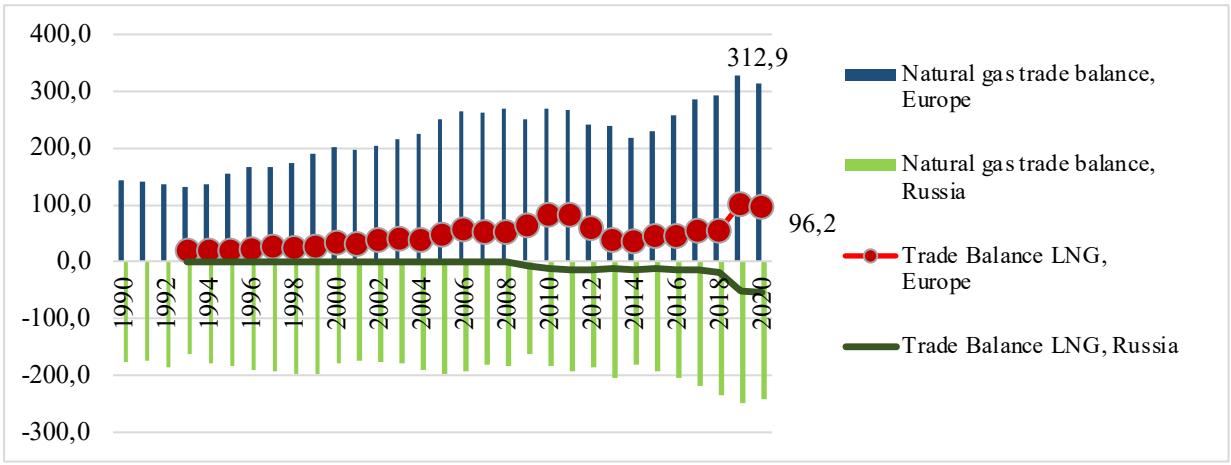

Figure 4. Dynamics of changes in the trade balance of natural gas and LNG in Europe and the Russian Federation, 1990 - 2020, bn cubic meters

Source: https://www.enerdata.ru

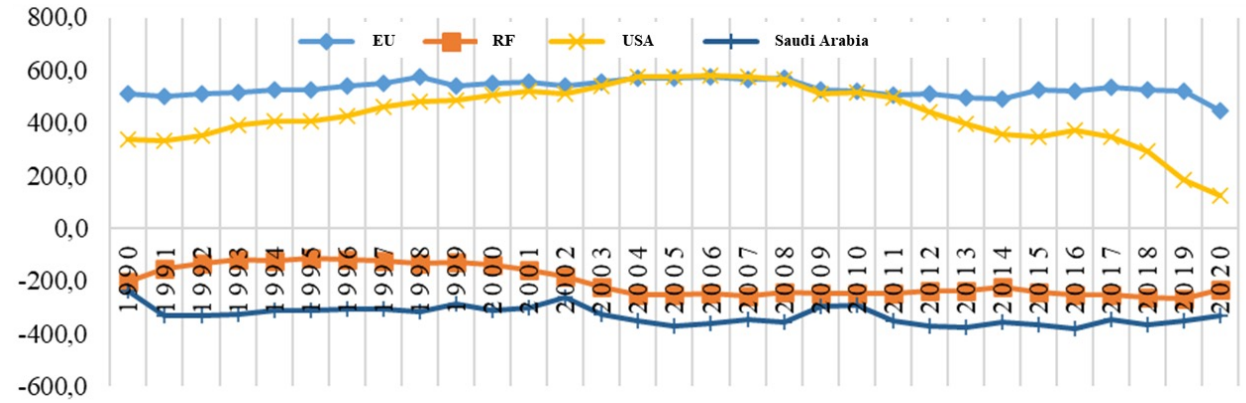

Figure 5. Dynamics of changes in the trade balance of crude oil for the period from 1990 to 2020, mln tons

Source: https://www.enerdata.ru

The energy crisis partly demonstrates reluctance of the renewable energy sources to meet the ever-growing global demand for energy from households and corporations (Fig. 6).

Therefore, it is necessary to consider claims to slow down the transition to energy until the renewable

energy sector is fully developed and ready to meet the ever-growing global demand for energy. Slowing down the transition to renewable energy is a necessary action (Borovsky & Shishkina, 2021).

Meanwhile, RES have the advantages. The most important advantage is that they do not pollute the atmosphere. Investments in the renewable energy sector are growing rapidly. Additionally, there have been significant improvements in battery technology. However, battery technology is not yet sufficiently developed to store large amounts of energy and provide the power required to meet national energy needs or to serve the national power grid. In contrast, the fossil fuel industry has been relatively ignored as investors exit the sector, resulting in a decline in fossil fuel energy stocks.

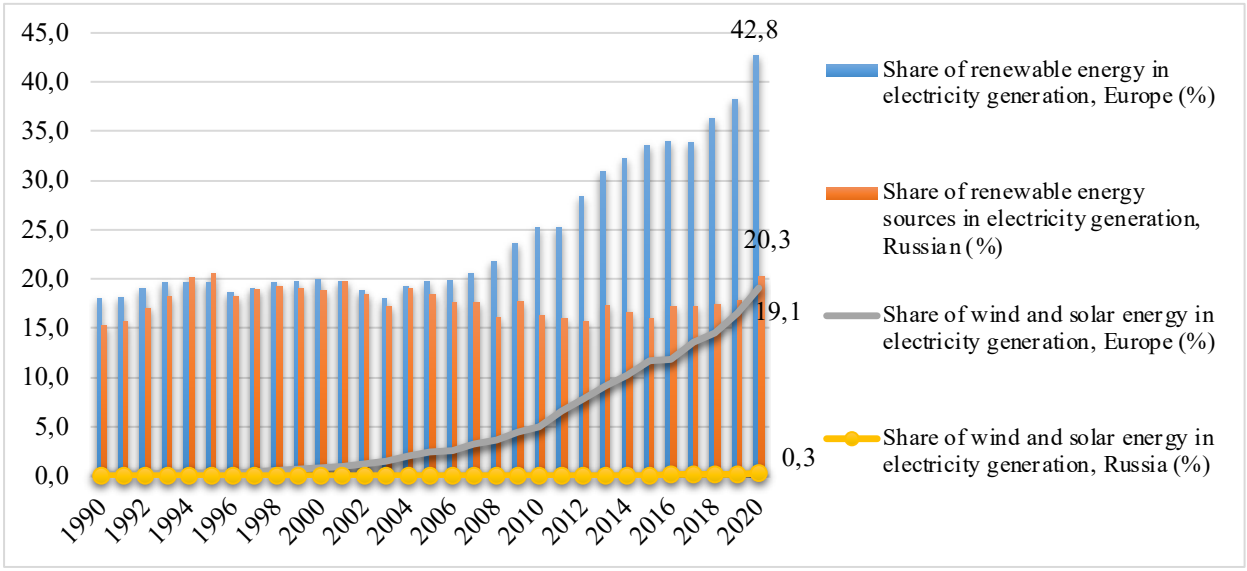

Figure 6. Dynamics of changes in the share of renewable energy sources and wind and solar energy in power production in Europe and the Russian Federation, 1990 - 2020, %

Source: https://www.enerdata.ru

It created a kind of vacuum. Subsequently, the recovery after COVID and the lifting of the restrictions of the pandemic era caused the unprecedented increase in energy demand, which could not be met by RES. Those RES were either undeveloped or developing, and it was also impossible to meet the growing demand due to depleted fossil fuel reserves due to the propaganda of the rapid RES transition. Excessive demand for energy against the background of depletion of the world's fossil fuel reserves caused an energy crisis in the UK, China, Lebanon, etc. The challenge faced by countries around the world during the recovery period is to reduce fossil fuel emissions to ensure the achievement of zero-carbon targets, as well as to guarantee energy supply to countries to avoid any undesirable socio-economic consequences of energy deficit.

Ahead of a large-scale energy crisis in 2022, world nations already have had complex energy challenges, such as rapidly rising global prices for natural gas and electricity. For example, in European countries, electricity prices have increased by more than 200%, especially in winter. The rise in electricity prices was caused by many factors, such as low natural gas reserves, low foreign supplies and sluggish maintenance work. It caused the shutdown of nuclear generators and other power plants. Further increase in electricity prices caused social protests. In the Middle East, the energy crisis affected Lebanon. Lebanon depleted stocks of imported fuel. It caused the fuel deficit in 2021.

India and China had an unexpected deficit of coal for utilities. Meanwhile, in India, more than 70% of electricity is generated by burning coal. In the middle of 2021, energy consumption in China increased due to the recovery period after COVID-19 and very hot weather. China had the most global blackout in a decade. Due to it, more than 20 factories in 31 provinces of China had unexpected shutdowns and growth retardation. The energy crisis in China was partly caused by the government's plan to decarbonize China's heavy industry, as well as attempts to reduce environmental pollution due to the climate change.

The UK provided state political support for the transition from the old economy (based on fossil fuels) to the new one (based on RES) before the crisis. It caused the money outflow from fossil fuel companies. Investors have started investing into renewable energy companies. Due to the lack of capital for fossil fuel enterprises, companies reduced their activities and production. Some fossil fuel companies attempted to have financial assistance, but failed. It forced them to terminate many of their employees. In August 2021, after the restrictions on the COVID-19 pandemic were completely released, the energy crisis became large scaled. It causes a sharp increase in energy consumption in winter.

Excessive demand for gas could not be met due to depletion of natural gas reserves and low wind speed in the UK. It caused gas deficit. Additionally, external factors, such as Brexit, also indirectly contributed to the energy crisis in the UK, as it made it difficult to import cheap gas from adjacent European countries. Brexit has also made it harder for heavy-duty vehicle (HGV) drivers to enter the UK to drive trucks and assist in the wholesale distribution of gas through many petrol stations. As a result, Brexit was a reason of HGV truck drivers' deficit in the UK. Consider the various measures taken by countries to minimise the impact of energy challenges. Those presented in Figure 7 had both positive and negative consequences. For example, in Punjab (India), the blackouts caused the protests. The UK regulator has limited the price that energy suppliers can charge consumers. This restriction caused the collapse of four small energy companies, as they were unable to raise the retail price of electricity to cover their operating costs. US demands from oil-producing countries to increase production have provoked the environmental activists. Regulation of rising gas prices in France caused the criticism of the French Economy Minister – Bruno Le Maire; he was accused of destroying 85% of the state-owned electricity giant EDF. EDF is under public regulation and forced to sell more of its electricity to competitors at a lower price. According to EDF, it will cost to the company 8 bn euros this year.

Country actions for mitigating energy challenges in the post-COVID-19

- Providing subsidies to energy suppliers and introducing marginal pride to protect citizens from electricity price increases as their economies fully recover from COVID-19 (Spain, Italy, Greece, UK).
- Shortage of coal in India caused coal use cancelling for non-energy purposes; coal supply only for energy purposes.
- Scheduled and rolling blackouts for households and industries (India, Lebanon, China), rationing of electricity to manufacturing plants (China).
- Marginal price limiting (the UK); limiting energy products prices and company profits (Spain).
- Providing loans to energy-intensive industries to help them pay energy bills; paying fuel bills for people on lower incomes (the UK).
- Financial help to the poorest households (France, Italy).
- Payments of €100 (£83) to low-income families (France); Denmark plans to issue a tax-free cheque to families with a system of individual gas heating (project not yet approved).
- Spain has reduced tax rates and introduced a temporary windfall profits tax for energy ofited from price spikes (the "Shock Plan"). The plan is to get €2.6 bn by the end of 2022 to redirect these profits to consumers in months when energy consumption was the highest one.
- Many countries suspended or slowed down the transition to green energy and renewables, e.g. Austria and Germany have reactivated some abandoned coal-fired power plants.

Figure 8. Country actions for mitigating energy challenges in the post-COVID-19, 2021
Source: composed by the authors

According to Fatih Birol, economist and energy expert, International Energy Agency CEO (hereinafter – IEA), the key aspect to mitigate the current energy crisis is the maximum use of existing oil and gas deposits, as well as the use of shale oil and gas as they quickly enter the market. Moreover, it is also necessary to reduce the amount of methane emissions from fossil fuel operations, and ensure the construction of liquefied natural gas terminals for the storage of ammonia or hydrogen in the future. He noted that most of the response measures should come from an emphasis on clean energy, renewable energy, energy efficiency, and an increase in nuclear production (in countries with nuclear potential) (Birol, 2022).

Today, the higher investment in clean energy is formidable ones. According to IEA, the key solution

to today's energy crisis – and to achieve net zero emissions – is to dramatically increase energy efficiency and clean energy. In terms of production, the most suitable options are short time projects and fast payback periods. They include, for example, shale oil and gas (which can be quickly brought to market), expansion of production from existing fields, and the use of natural gas. New infrastructure may also be needed to facilitate the diversification of supplies outside of Russia. It is especially important for the European Union, since an embargo on oil supplies from the Russian Federation is being imposed on December 5, 2022. Many European countries try to implement LNG import terminals. Moreover, with careful investment planning, they have opportunities to facilitate future imports of hydrogen or ammonia. However, the long-term strategies to today's crisis are to reduce demand due to the rapid introduction of renewable energy, energy efficiency, and other low-emission technologies. They include maximizing the use of nuclear energy in countries which assess their future energy balance.

In the long term, renewable energy sources are one way to maintain affordable energy prices while facilitating the transition to zero consumption.

Among the continents of the world, Asia is the largest investor in solar energy. Having overtaken Germany in 2015, China is now the world leader in the use of photovoltaic systems, with an installed capacity of 174 GW. Moreover, country energy suppliers plan to place a solar power plant about 22,000 miles above earth.

Germany has been one of the leading producers of solar energy on the planet for many years. More than 120,000 German households have solar panels, and more than 30 important photovoltaic power plants are located throughout the country. Germany plans to use only renewable energy sources by 2050.

Japan has been one of the leaders in the field of renewable energy since the 1990s. In addition to being at the forefront of electricity generation, Japan is also one of the largest producers of technologies for the solar panels. For the past two years, the Japanese government has considered solar energy as one of country priorities. They have made the panels more attractive and accessible to citizens by reducing the cost of installing solar panels[2].

Other examples of countries using solar energy are:

– in terms of installed capacity, the UK has finally managed to overtake Spain and France. Public initiatives encouraging households, businesses, and schools to use solar panels have successfully helped the UK become one of the leading producers of solar energy on the continent;

– over the past decade, the use of solar energy in Australia has increased significantly: as of September 2019, more than 2 million plants were installed. However, many people believe the country could have done much more – there are many hours of sunshine in almost all areas of Australia. Indeed, the government plans to finance new plants and increase production next years;

– over the past decade, Italy's dependence on solar energy production has increased dramatically. In 2009-2013, the installed photovoltaic capacity of Italy increased 15 times, overtaking the USA, Japan and China. However, the tax benefits provided by the government to solar farms have cancelled. It causes the closure or sale of many farms producing solar energy. Nevertheless, Italy is still one of the leading countries in Europe in terms of the use of solar energy;

– since India is a developing country, this energy plays a crucial role in the purification and heating of water in many of its regions. The government of India plans to increase the installed capacity to 100 GW next years;

– The USA has a long history of solar energy implementation. Since the launch of the SEGS thermal power plant in 1983, more than 17 million megawatt-hours have been produced. The United States is steadily increasing its status as a leader in solar energy production – in 2014 almost $ 20 bn was invested in the solar energy industry.

According to experts, Europe's rapid transition to a sustainable low-carbon future is impossible without the involvement and participation of citizens who produce and consume this energy locally. Forest fires,

[2] *Samsa, M. Top 10 Countries Using Solar Energy – Solar Panel Renewable Energy. Available at: https://energieadvisor.org/countries-that-use-solar-energy/ (accessed 17.11.2022).*

drought and record heat caused by climate disruption, combined with a sharp rise in gas and electricity prices due to the Ukrainian crisis, made the transition to alternative, renewable sources even more urgent[3].

Many European communities (i.e. solar panels on the Netherlands, biomass burners in Spain, etc.) are increasingly producing, consuming, and selling their own energy. This EU trend is crucial one in terms of the achievement of climate sustainability. According to the latest data, 2 mln Europeans currently participate in 7,000 local energy communities across the continent. Moreover, their number is growing rapidly after the introduction of the EU directives on the development of clean energy and energy communities in 2018-2019. They will play a key role in Europe's transition to green energy, because as heat pumps replace gas boilers and electric vehicles replace internal combustion engines, highly centralized power generation and distribution systems – power plants and networks – will not be able to adequately handle with the huge demand. The only way is increasing of decentralization, production, and consumption of more energy locally using sources such as solar and wind, as well as increased storage and intelligent solutions for efficient energy management. It provides the involvement of ordinary citizens into this particular process.

Some communities have been successfully operating for many years. For example, in the Bera Bera district of San Sebastian, Spain, a cooperative has been operating since 1985, providing hot water and communal heating to more than 500 of its members. Studies of energy exchange models between equal partners show their accessible, democratic, cooperative and socially nature in comparison with the traditional energy markets. In essence, they prosper because of the social interconnectedness between end-users, rather than on the basis of competing economic interests.

Thus, the key feature of the modern crisis is a clear political character, namely the confrontation between Russia and the West. Indeed, by imposing sanctions against Russia and restricting the import of Russian energy carriers, Europe is driving itself into an energy crisis. In addition, a further series of events, such as the undermining of the Nord Stream and the OPEC+ agreement on reducing oil production, only deteriorate the current situation, also for the United States. The EU's prosperity consisted in importing cheap Russian energy, and in the current situation they need to source energy from European countries. In this connection, the EU economy will undergo significant structural changes.

Conclusion

Currently, the solution can only be the complex use of various measures. Renewable energy sources are one of the possible solutions. However, at the moment RES cannot fully deal with the current complex energy situation. In the framework of a comprehensive approach to this problem, RES can be one of its tools. In addition, the social aspect of RES implementation is of great importance for the EU.

Moreover, diversification of both energy resources and their suppliers is extremely important for economic systems of various levels.

The most important condition for this is the depoliticization of energy security. The attempt to make energy (a necessary condition for economic growth) the subject of political confrontation is a challenge to the global energy security system. Furthermore, in terms of the fact that a third of the world's population does not have access to energy resources, the global social dimension of energy security also becomes obvious one.

The inability to develop the economy without energy also implies the impossibility of overcoming problems recognised by the world community as global: poverty, epidemics, low level of education, environmental threats, etc.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

Viktoriya A. Kravchenko – conceptualization, project administration, funding acquisition, writing – original draft.

Evgeny B. Mishin – data curation, formal analysis, validation, writing – review & editing.

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