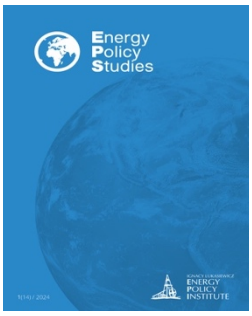

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Pan-European Energy Initiatives and their implementation. Incoming Black Death as threat for Nuclear Energy Renaissance

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Abstract: This work focuses on the prospects of pan-European initiatives to enhance the energy rigidity situation in Europe from the Russian Federation. Additionally, it examines the current documented changes in the retrospective on the Green Deal and its reform from within, in the narratives of strengthening the position of Nuclear Energy in Green Taxonomy. All of this is encapsulated within a palette of metaphors for the illustrious cultural Renaissance, which, as a significant event in European history, resulted from an external catastrophic catastrophe known as the Black Death. This event had a considerable influence on the subsequent release from the burdens of the past for the sake of a promising future. The work addresses several fundamental questions regarding the "European" nature of the Energy Renaissance, the pan-European initiatives themselves, and the labeling of the creation of small nuclear modular reactors of the 4th generation as a strategic stance aimed at strengthening the competitiveness of Europe in the current economic and strategic environment. The primary objective of this work is to investigate the phenomenon of Nuclear Energy Renaissance, establish a distinct terminological foundation for it, and formulate the prospects of nuclear energy in Europe. The research questions revolve around the issue of the expansion of Europe's energy crisis and the potential for nuclear energy to emerge as a viable option for the future of the EU through the deconstruction of EU Energy Policy under a New Green Taxonomy. It also questions the potential for nuclear energy to become a mainstream form of energy in Europe and how deep we can expect the involvement of European states in supporting raising initiatives regarding nuclear energy while facing at the same time the direct threat from the Russian Federation. The hypothesis of this work is that, after the energy crisis, nuclear power in Europe received a second chance despite the expansion of nuclear power plants around the world, advances in technology, and increased safety standards. The conflict in Ukraine and the subsequent crisis demonstrated that the green agreement can be maintained only if nuclear energy is included in the Green Taxonomy of the European Union. For the sake of a good methodological analysis, it was preferred to rely on various official documents published from various institutions of the European Union, academic articles on energy in Europe and statistical information for a broad outlook and case study analysis. Article works under the framework of Mixed-Methods Research for better awareness regarding truly diverse areas of study such as Energy Policies as well as usage of official published statistics, tables, and other quantitative methods variations.

Key words: Nuclear Energy Renaissance, SMRs, Energy Sovereignty, Industrial Alliance, Green Deal, Green Taxonomy

Introduction

The great cultural-intellectual, technological, and scientific achievements of Ancient Greece and Rome still have an imprint on the hearts of every European. The very attraction to such nostalgia in the 14th century was due to the mysterious aesthetics of lost grandeur, persecuted by the church for its pagan nature. The Renaissance era emerged as a socio-economic phenomenon, characterized by the expansion of large manufacturing cities and the establishment of urban-type republics that accumulated enormous wealth through the importance of trade routes. According to Norman Cantor, a prominent American medievalist, Europe would not have been as transformed without the impact of the Black Death, which raged on the European continent in 1346 and ended the lives of millions of people (Cantor 2015: 138). It was one of the first times that mankind encountered a mass catastrophe that forever changed the demographic and social hierarchy. In the distant future, it could only be comparable with the consequences of the Lisbon earthquake in 1755. Another renowned historian, David Herlihy, made a candid assertion in his book *The Black Death and the Transformation of the West*: "The Black Death was a trauma that liberated a new", new incarnation, adorned in an outdated attire that we commonly refer to as the Renaissance (Herlihy 1997: 59-60). The Black Death, on the one hand, was a calamity that had the potential to eradicate the enduring legacy of European civilization. However, on the other hand, it served as a catalyst for the emergence of a new era and the rebirth of the new spirit of enlightenment through the revival of old that worked in synergy with an institution that once aimed to eradicate the great name of ancient Rome.

Today, within the souls of individuals who have dedicated their lives to the study of a potent phenomenon as atomic energy, there exist the seeds of their Renaissance, founded on the practical implementation of the inventions of genuine progress as the perfection of the collective power of the spirit of mankind. The study of atomic physics during the 20th century acquired a significant breakthrough character in all spheres of human development. The concept of controlling atomic matter by man sparked secular enlightenment, overcoming the chains that man imposed upon himself to constrain his desire for knowledge. Regrettably, the era of great discoveries has passed, but for those who witnessed massive catastrophes, nuclear energy remains the subject of internal moral debate, or it will always remain a remnant of the past.

Pan-European Initiatives

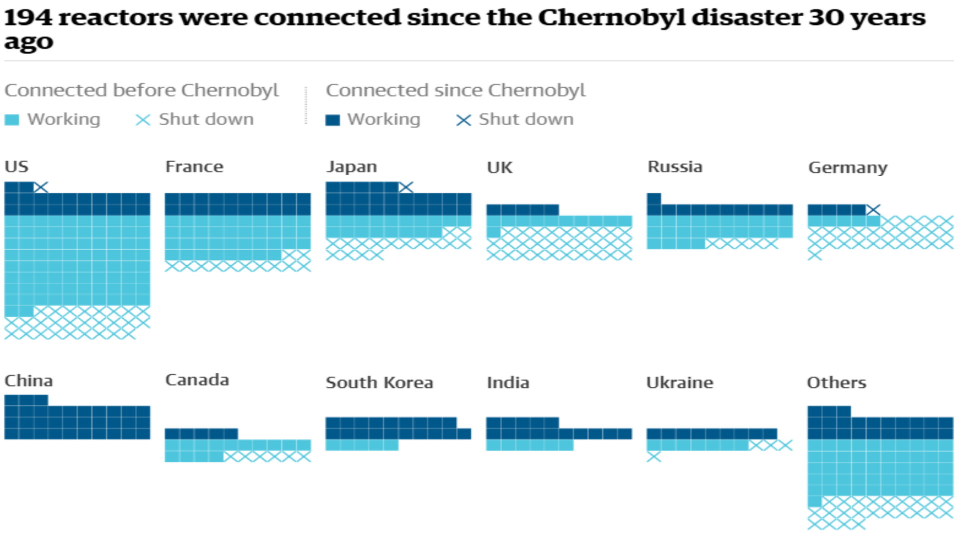
The central theme of the work is precisely timed to coincide with the pan-European nature of leading initiatives in the European Union regarding nuclear energy regulations, and its increasing significance considering issues with the regulation of prices in numerous countries of the European Union, as well as the threat of EU energy sovereignty. The first thing to point out is *the Proposal for a Regulation of The European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design* that was published in 2023. The proposal referred to in the title is comprehensible as it addresses a crucial concern in the energy sector pertaining to electricity prices and the financial well-being of individuals as a result of the sanctions imposed on all forms of coal supplied to the EU from Russia, as well as reductions in gas supply. In addition to the declarations regarding the significance of deregulation of the electricity market, a greater involvement of states in price control, and the expansion of investments in renewable energy sources. It is also noteworthy to mention the additional measure to facilitate new investments in nuclear energy, as stated in Article 19b (European Commission 2023: 37). The proposal is currently under consideration in the European Parliament and The Council. Nonetheless, its primary significance lies in its origins as a supranational representative of the member nations of the European Union, rather than as a singular proposal from any nation-state or coalition. Additionally, there appears to be a significant precedent for the absence of any mention of gas-fired sources of electricity production, indicating a firm belief in nuclear power as a more promising alternative to them. This will undoubtedly impact the long-term viability of nuclear energy rhetoric among EU states. The second document that is called *Commission delegated regulation (EU) 2022/1214*, which was put up for adoption in 2022 and entered into force in 2023, is perhaps even more fundamental to the discussion on the implementation of initiatives related to nuclear energy in general, and from which all other political measures aimed at strengthening the position of nuclear energy in the Green Deal are derived. The essence of regulation hinges on the inclusion of nuclear energy in the Taxonomy for appropriate investment, accompanied by precise criteria to ensure compliance with the primary guidelines on carbon neutrality. Furthermore, due to numerous internal contradictions, it is permissible to utilize nuclear power solely as a transitory method to achieve the objectives set by the Green Deal itself (European Commission 2022: 2-3). The third initiative aims to implement the strategy of an inter-European Industrial alliance within the EU and outside, which advocates for enhanced development and investment in small modular reactors of the fourth generation, incorporating enhanced technologies for reprocessing and recycling nuclear fuel, and all aspects of waste management, in accordance with the criteria adapted in Energy Taxonomy. The initiatives constitute fundamental elements in the rise of the Nuclear Energy Renaissance in the European Union.

Nuclear Energy Renaissance - European Phenomenon?

The phenomenon commonly referred to as an Energy Renaissance lacks a formal terminological basis and is more strongly associated with the general trend towards obtaining cleaner energy and stepping away from fossil fuels usage. The question remains unanswered whether the Renaissance is solely concerned with obtaining energy through sustainable and safe generating technologies, without releasing any other harmful substances besides CO_2. Also, the question remains on the nature of the Nuclear Energy Renaissance: whether it is exclusively European, whether the same trends arise between other continents, whether it derived from a quantitative factor of numerous new power plants construction, whether it is about technological innovations as SMRs etc. The notion of the Energy Renaissance holds a metaphorical significance, and the analogy with the European Cultural Renaissance has a direct resonance with it. Not long ago, the overall sentiment toward nuclear energy was mostly pessimistic and negative within the public outlook towards nuclear energy and its widespread proliferation in relation to its destructive potential. Following the Second World War, various social and activist organizations expressed their disapproval of nuclear energy and deemed it an ineffective means of ensuring future energy security. Nonetheless, we are witnessing a re-emergence of nuclear energy in the general discourse owing to the escalation of the energy sovereignty crisis. To obtain a fresh perspective on a fundamentally different reality, it is imperative that we must liberate ourselves from preconceived notions and unite in the fusion of environmentally friendly renewable sources and nuclear energy. Regrettably, at the onset of significant transformations, during which the European Union assumed its exclusive role as a staunch advocate of renewable energy, all changed with the onset of the conflict in Ukraine, determined as the Black Death of the 21st century and great challenge, which will ultimately determine the fate of Europe's energy sovereignty and its position as global power.

When asked if the Energy Renaissance is an exclusively European phenomenon, there are several answers to this fundamental concern. It is a known fact that only Europe and Japan have reached a consensus on a common position to limit the impact of nuclear energy on the grid. Furthermore, the nuclear race and the general tension of the Cold War era particularly traumatized the populace due to the potential global conflict between the West and the USSR. It is imperative to recall the Chernobyl Disaster of 1986, which profoundly altered the political and social landscape regarding the narratives on energy consumption from Nuclear Power Plants. It led to countries such as Italy abandoning the production of nuclear energy and closing its final station in 1990. Germany consistently insisted on the closure of the final three nuclear power plants by 2023, and as indicated by the statistics, the total world electricity production experienced a decline of up to 10% from the 1986 values by 2022 (Buchholz 2022). According to Figure 1, the Chernobyl nuclear catastrophe has not affected other countries, and the total number of nuclear power plants has continued to increase across the world. Since Chernobyl, China alone has opened more than 50 nuclear power stations and by 2016 their number doubled from 194 to 406 (The Guardian 2016).

Fig.1. Number of nuclear reactors connected since 1986 Chernobyl disaster with their operational status



Source: The Guardian 2016 https://www.theguardian.com/environment/2016/apr/30/has-chernobyl-disaster-affected-number-of-nuclear-plants-built (access: 17.09.2024).

Many decommissioned nuclear power plants were of sufficient age to permit their continued operation. It demonstrates that there was a certain anti-nuclear agenda visible in politics of that period that was intertwined with the rise of the first wave of Green Activism in Europe. Furthermore, it demonstrates the exclusivity of the Nuclear Energy Renaissance in Europe, observing a statistical fact that was already revealed. The Fukushima incident did not have an impact on any closure of nuclear facilities or conservation of plans to build them outside Japan in Asia. Japan has merely delayed the construction of large nuclear power plants with at least 1300 MWe Capacity Gross: Shimano-3 and Ohma-1 (World Nuclear Association 2024). It is also important to provide public support for the further implementation of initiatives such as these, particularly in such a country as Japan with a disengaged society in general, as was observed through past parliamentary elections. In Japan, there were reports of a moderate increase in positive opinions among the public toward the unavoidability of nuclear power use, but this was only up until the Fukushima Daiichi accident, as they decreased significantly post-accident; meanwhile, after more than 10 years of the accident, there was a slight decrease in opinions toward nuclear power non-use and a slight increase in positive opinions toward nuclear power use (Yamagata 2024: 2). Returning to China, the state that has undergone numerous transitions over the past century, directs a new narrative regarding the country's foreign and domestic policies towards cooperation in reducing CO2 emissions into the atmosphere and renewable energy infrastructure development. The strategy and further domestic results of work in this direction were voiced in the organization of the United Nations for the topic of prospects for cooperation of the global South as a geopolitical goal. This suggests that China, in turn, would like to be the main technology supplier in developing countries by pushing the European Union into the behind-the-scenes. After 2018, China's newly installed capacity of solar PV accounted for more than 40% of globally installed capacity and reached 392GW. Wind power generated 370GW, or 37% of global capacity. In 2023, there has been an additional spike in solar installation; by August 2023, new capacity exceeded 100GW (United Nations 2023: 26). However, it is too early to say that China is the same as Russia's geopolitical maneuvers against European Energy sovereignty, and there is an affirmative argument. Despite the figures, one can observe a certain fundamental pattern when looking at the location of the same wind turbine constructions in China. Their main location is in the provinces of Inner Mongolia and Gansu. At this point, the northern wind power potential accounts for about 78% of the total wind power potential in the country, which is inconsistent with Huang's (2020) findings that 90% of China's wind power potential is in the north (Yu, Gui & Yang 2022: 13103). Their location is justified by the fact that the sparsely populated areas of these provinces do not require large nuclear or thermal reactors due to the length of the regions and the associated costs. The considerable number of windmills is a convenient alternative, given that the focus is still on building new nuclear power stations in the extremely populated eastern provinces of China (Jiang and Xiao 2018: 139). The media attention around the world has also caught the common statement of the MFAs of China, South Korea, and several other countries about the vehement criticism of the radioactive waste discharge from Fukushima. It was a more political than a environmental concern on the Chinese side and therefore no actual sanctions were imposed on Japan, as can be seen from a passage of China's foreign policy ministry. The Japanese government failed to prove the legitimacy and legality of the ocean discharge decision, the long-term reliability of the purification facility, and the authenticity and accuracy of the nuclear-contaminated water data (MFA of People's Republic of China 2024). Despite a strong emphasis on the logistics system for the distribution of energy and electricity, this framework serves as solid evidence of the effectiveness of such management of nuclear and renewable energy mix, which can be used to establish a new wave of innovation in Chinese industry and contribute to the preservation of planet Earth.

Path to Innovations – SMR`s

Innovation and the implementation of revolutionary technologies play a key role in transforming the existing framework, thereunto evolving our perceptions of social relations with interdependent values within human society. The European Cultural Renaissance was no exception and presented a varied modernization of urban planning in the areas of living, architecture, technology, and science. The blueprints that were created in the 15th century by Leonardo da Vinci are not indifferent to any respected self-scientist who cannot imagine the quality and ingenuity of genius. Within the scope of today's energy science, great attention is paid to one unique scheme within the framework of nuclear energy discourse. Small modular reactors, commonly called SMRs, represent a new category of nuclear innovation that aims to provide sufficient energy while reducing construction costs and saving time. Peter Beck and Malcolm Grimston from the Royal Institute of International Affairs have formulated the position of large nuclear reactors relative to other known means of electricity generation on the market:

> *Regarding economics, it was already mentioned earlier, that the competitive position of new nuclear power plants has deteriorated over the last decade owing to the development of gas-fired combined cycle generating plants and the effect of deregulation of the electricity market. The generating industry is looking for reactor designs of lower cost per unit of capacity, higher efficiency and flexibility regarding scale, but most developments on offer for the LWR are for large scale plant which are unlikely to achieve this.* (Beck and Malcolm 2002: 42)

As novel approaches to nuclear fuel and waste management emerge, the potential for reducing emissions and environmental damage is highly respected in environmental engineering. Large reactors require substantial resources, such as water, to be continuously cooled, which presents significant challenges due to their size and mobility. This is not the case with SMRs, which do not require large land and river networks. Under the present war-induced circumstances, there are already initial stages of an Industrial Alliance to lobby for small modular reactors in the European Union, led by France (WNN 2024). From 29 to 30 May 2024, the alliance held its first assembly, which included not only representatives of energy corporations, institutes, and their countries, but also representatives from countries that are not part of the European Union, such as Ukraine and the Institute of Research and Design (European Commission 2024). This is, in fact, in its early design — the Pan-European Initiative aimed at strengthening Europe's energy sovereignty. At the time of NEA Research in 2021, only France is conceptually developing a 170 MWe capacity multi-module nuclear reactor in the European Union based on the light water reactor type (LWR-PWR) from the NUWARD design (NEA 2021: 18).

Obstacles on the path for future

Despite significant advancements in the planning of the Pan-European innovation towards small modular reactors, numerous obstacles remain in the way of achieving these solutions. The initial aspect is less significant and relies on funding and intellectual capital to generate and disseminate technology, as witnessed in the United States, China, Russia, and South Korea. In many ways, France's interest is not just an individual decision to continue as one of the advanced powers and not lag its competitors in the field of nuclear energy. Rather, it involves the rest of Europe and its intellectual and financial capital in a fundamental shift in Europe's energy sovereignty in such a challenging period. Euratom's report specifically mentions the geopolitical significance of this competition and the direct involvement of the EU itself. The European Union must be at the forefront of new developments, ensuring a European industrial value chain while being at the top of safety and radiation protection standards for SMRs (Euratom 2023: 40). Therefore, we can take as an example the case of U-Battery, a conceptual design developed jointly by Manchester and Delft universities, which, due to its inability to find sustainable financial support, was unable to come out within its concept. In 2023, its development was completely closed (Urenco 2023). The second aspect pertains directly to the conflict in Ukraine and the significant shifts it entails, as opposed to the strategy promoted by the alliance, which emphasizes the modular reactors construction approach. Missile attacks by the Russian Federation on energy facilities in Ukraine have gradually destroyed energy planning and left cities in a daily state of collapse and blackouts, disrupting the work of public logistics and infrastructure. This has been particularly the case for thermal and hydroelectric power plants. Around 20 substations and electric stations were being hit by Russia, as what have been documented through research (Polityuk 2024). At the same time, there is an incredible tension at the Russian-occupied Zaporizhzhia Nuclear Power Plant, where the presence of military contingent and equipment has been repeatedly observed, as well as the construction of fortifications around the station. The IAEA mission is constantly monitoring the station, but no political decision on isolating the station from combat hasn't been taken. However, it is not anticipated that there will be a gradual escalation, as a nuclear catastrophe always entails additional dimensions.

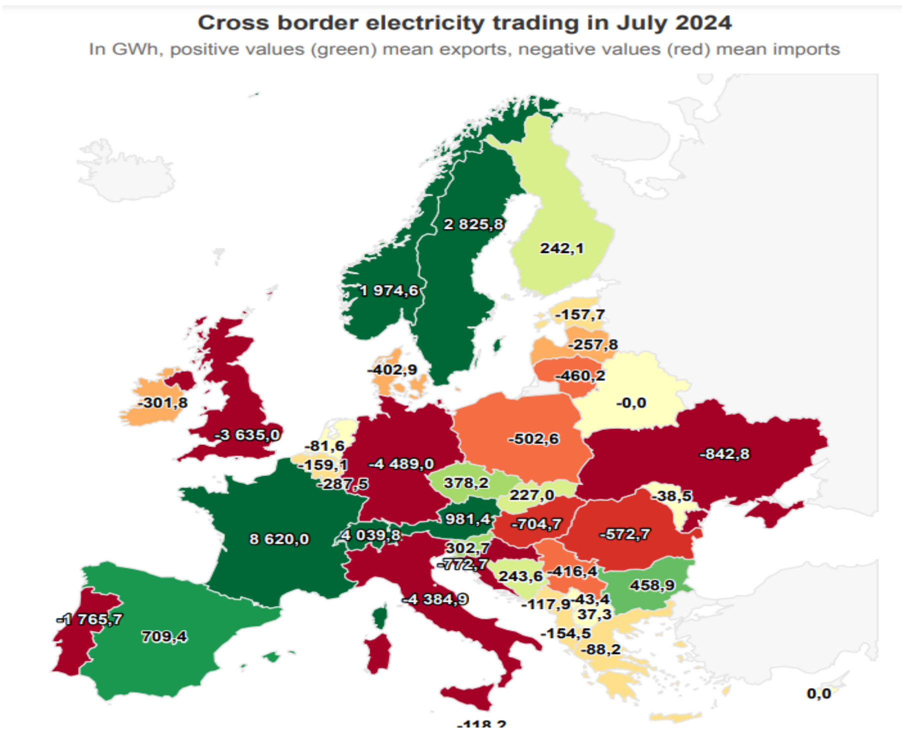
Throughout history, no nuclear power plant has been targeted or attacked by any other nation. This suggests that it may be directly a lever of pressure, but not the objective of destruction, that will trigger the chain reaction. Regrettably, this does not negate the fact that crucial infrastructure facilities, such as Nuclear Power Plants, necessitate meticulous oversight and substantial investments in air defense systems to deflect potential missile attacks or drones. The recent media report regarding a Russian drone spying on a nuclear power plant in Brunsbüttel, Germany, which is currently under investigation, serves as a noteworthy illustration (Tiwari 2024). Due to the development of small modular reactors, NATO will require more air defense systems to safeguard these facilities and enhance strategic coordination.

As previously mentioned, it was precisely the catastrophic actions associated with the utilization of nuclear energy that engendered such a strong public aversion towards discussing the subject of atomic energetics. These include the destructive power of atomic arsenals, military vehicles such as aircraft carriers and submarines, and numerous accidents with nuclear power stations that extend beyond accidents on Chernobyl and Fukushima. At that time, the world was witness to a singular dichotomy, namely that of environmentalists who oppose the utilization of nuclear energy, and those who advocate for atomic energy as a necessity in a world where progress plays a leading role in preserving its own influence. Among them were various groups of people, representatives of mass culture, war veterans and even church activists whose contribution was especially widespread in Central Europe (Ault 2021: 100-101). This picture is still prevalent today, especially in Germany. Despite the war, the damage done to the Nord Stream, and the return of gas directly from Russia, Germany persists in adhering to the gas core of its energy policy and intends to construct additional gas-fired units with a new trading partner — Norway. It is also planned to open coal mines that have been shut down due to their detrimental effects on nature (Kędzierski 2023). The rejection of Germany's atomic program may be attributed to its neutral status as a non-nuclear state and fear coming from other political actors. Furthermore, for logistical reasons, to develop the atomic program, it will be necessary to retrain engineering personnel, burocracy, and allocate substantial funds into the economy, which is unthinkable with the current state of German economic stagnation. The German Republic is not ready for such a significant transformation and already prioritized its energy mix that were allowed to do as transition stage by The Council of EU. The European Council has acknowledged the need to ensure energy security while respecting Member States' right to choose their energy mix and to choose the most appropriate technologies. Some Member States use or will use nuclear energy as part of their national energy mix (Euratom 2023:

40). As stated in *the Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU)2018/2001 and (EU) 2019/944 to improve the Union's electricity market design* of March 14, 2023, the goal is to solve the energy crisis, which has significantly affected the electricity market for consumers and businesses (European Commission 2023: 1-2). As previously stated, many of the proposals are being halted due to the reaffirmation of nuclear power as a crucial component of the revised Green Deal and its stated objectives by 2050. Consequently, certain states whose energy is directly dependent on nuclear power plants are being given an advantage, while others are being forced to undergo significant changes by abandoning gas and coal.

The chaotic picture of the distribution of electricity exports and imports in Europe is another basis for a fundamental restructuring of the entire core and strategy of EU energy policies. Nuclear power plants can be one of the ways out of this crisis. The European Union has an uneven distribution of energy responsibilities due to its weak influence over national governments. Observing (Figure 2) map chart in July 2024, states such as Germany and Italy each import a total of 4,400 GWh of electricity, whereas France, as the leading nation in the construction of nuclear power plants, exports a total of 8,862 GWh (Fraunhofer 2024).

Fig. 2. Cross border electricity trading in July 2024 across the Europe



Source: Fraunhofer 2024, https://www.energy-charts.info/charts/import_export_map/chart.htm?l=en&c=UA&interval=month&month=07 (access: 17.09.2024).

Since February 2024, Italy, the UK, and Germany have been confronted with a critical issue that only serves to exacerbate the prospect of stabilizing prices in the electricity market that only led to the confession that was written as the primary objective in the European Commission official proposal. According to Eurostat, the implementation of the initiatives regarding the obtention of electricity from renewable sources has not become popular among household owners of Europe in the most populated countries, and progress in this direction unfortunately departs from the predictive goal of the Paris Agreement (Eurostat 2022). Despite several objective advantages of implementing renewable energy sources, which can reduce the burden on the electricity market and improve the state of the budget deficit and set a new level of personal freedom for people and their financial well-being, the availability, simplicity, and practicality of technology plays a vital role. Despite their enormous contribution to the dissemination of green energy and the preservation of environmental concerns, solar panels remain a niche and entertaining phenomenon, rather than a mandatory requirement in every building. The war in Ukraine only reinforced the importance of the existence of autonomous environments for obtaining electricity through the involved missile attacks on critical infrastructure as thermal power stations. It is unimaginable for us to exist without access to a continuous supply of electricity and the operation of cable networks. Moreover, the recent conflict in Ukraine demonstrates how the Russian Federation is attempting to undermine the morale of the populace that has been impacted by this conflict. Opportunities to circumvent this death loop can be found in the paradoxical view of the combined desire to overcome and liberate oneself from the burden of hatred and fear of nuclear power and provide a greater emphasis on deregulation of the electricity market and encouraging the installation of renewable sources of electricity. Moreover, the decision of the European Commission and nuclear alliance of the states to incorporate nuclear energy into the Green Taxonomy and modify the Green Deal as a global initiative leading to the allocation of funds for the implementation of an energy strategy to alleviate the crisis holds significant importance (The Economist 2022).

Geopolitical Confrontation

Not only did France play a decisive role in the decision, but also the active involvement of the Czech Republic, one of the largest beneficiaries of military assistance to Ukraine. The Czech Republic expresses grave concern regarding the substantial presence of Russia in cases of aid for the construction of nuclear reactors in Hungary and Slovakia, as well as the escalating presence of the aggressor state on EU territory. The decision was deemed exceptional, namely, to involve a partner from South Korea in the construction of nuclear power plants and, as per the news release, to confirm the agreement by 2025 (Shaw 2024). It is not South Korea's first appearance in the European political arena, as Poland had previously made a deal to supply weapons to Seoul, especially tanks, due to the growing threat from Russia. South Korea is providing bilateral assistance to Europe in order to swiftly respond to the current turmoil (Reuters 2024). When considering other geopolitical actors, it is impossible not to mention Turkey as one of the main trading partners for many EU countries and a provider of labor. With Erdoğan's rise to power, relations between the EU and Turkey have seriously deteriorated, allowing Russia to become involved in the construction of the Nuclear Power Plant and increasingly pull back on key partnership of the EU countries in promoting their values in the Turkish political landscape and further talks in conflict resolution in Cyprus. A very illustrative point was given by Mehmet Çağatay Güler in his book *Building Nuclear Empire* about Russian nuclear geopolitical doctrine:

> *Thirdly, among the other countries where the Russian Federation has been pursuing nuclear power plant projects, Turkey, along with Hungary, is a member country to North Atlantic Treaty Organization (NATO). Considering the decades-long tensions between NATO and Russia, having an ally that is not only a neighbor and a pro-Western country but also a NATO member would provide an opportunity for more influence and balance for Russian foreign policy in Turkey and even beyond* (Güler 2020: 17).

The Russian military doctrine is actively encouraging hybrid wars and the disintegration of open diplomatic and commercial ties. The military coups in Burkina Faso, Niger, and Mali, during which the PMC Wagner took responsibility as the guardians of order, have emerged as a distinct red line for France. The political orientation of these rebels is based entirely on the political support and legitimacy of the war that the Russian Federation is waging. Russia behaves like a plague, not only attempting to eradicate all that it and the European Union share, but also rapidly disseminating by obstructing any supplementary pathways to energy recovery. These countries in West Africa hold significant importance in terms of their resource potential and the export of ore for nuclear power plants. At the same time, Putin, for full consolidation with the ruling military regime, is going to invest in the construction of the Nuclear Power Plant in Burkina Faso (Aradi 2023).

Conclusion

To summarize, the conceptual initiatives of several nations that are experiencing energy vulnerabilities and anticipating Europe's continued prominence on the global stage leave a promising impression in the resistance against the global threat posed by Russia. Simultaneously, there remains considerable uncertainty and apprehension regarding the implementation of novel innovations in small modular reactors, particularly if such a solution fails to garner additional support from the remaining nations of the Union and focuses on the proliferation of air defense systems. The fundamental narrative aims to incorporate nuclear sources into the overall formulation of the Green Deal to adapt to the contemporary European energy sovereignty and its constructive interaction with zero-waste renewable energy sources as a component of the European Energy Renaissance.

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