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Drivers of the EU's Energy Transition Under a Geopolitical Logic: Taking the Russia–Ukraine Conflict as a Watershed

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Abstract:
Since the outbreak of the Russia–Ukraine conflict in February 2022, the European Union's energy security has sustained an unprecedented shock: pipeline gas supplies from Russia plunged, and the EU's dependence on Russian natural gas imports fell from 45% in 2021 to 8% in 2023. Against this backdrop, the EU rolled out major energyrelated policies such as the Roadmap to Fully End EU Dependency on Russian Energy, the revised "Fit for 55" package, and the Carbon Border Adjustment Mechanism (CBAM), aiming to achieve strategic autonomy, build diversified supplies, and elevate its technological voice. Focusing on shifts in the international order following this triggertype geopolitical event, this article, grounded in realist geopolitical theory, analyzes the drivers of the EU's energy transition through three core logics: control of geographic space, resource scarcity, and power competition.

Keywords: European Union, energy strategy, geopolitics, Russia–Ukraine conflict

1. Introduction

Energy is the material foundation of economic growth and social development, thus occupies a special place in national development strategies. The unevenness and scarcity of conventional energy impart a pronounced geopolitical character to energy, making it an important factor in triggering geopolitical crises. As a good defined by territorial and spatial perspectives, energy has long been shaped by the evolution of the global geopolitical landscape over time.

Since February 2022, the Russia–Ukraine conflict has precipitated an energy crisis in the EU. Following escalation, Russia suspended supply along parts of its pipelines; coupled with the sabotage of the Nord Stream pipeline and the EU's "decoupling from Russian energy" policies, the share of Russian pipeline gas in EU imports fell from 45% in 2021 to around 8% in 2023[1]. The result was a fractured energy supply chain, with spillovers reaching households and industry[2]. The EU responded with a series of policies to adjust its energy strategy and safeguard resource security.

The burst of policy activity prompted by the sudden outbreak of the conflict was not a sluggish response to energy security. In fact, the EU is a regional inte-

gration organization highly dependent on energy resources and relatively resourcepoor[3]. Confronted with the supply shock of curtailed Russian gas and a broken supply chain, the EU quickly deployed policy tools to rebuild its geopolitical advantages. The REPowerEU plan released in May 2022 set out to essentially end imports of Russian fossil fuels by 2027, pursuing diversified supply and demandside reductions through expanded LNG terminal capacity, enhancement of the Southern Gas Corridor, and promotion of household heat pumps and building retrofits. In parallel, the revised "Fit for 55" package tightened the scope of the Emissions Trading System (ETS) and introduced the CBAM, seeking to convert the EU's lowcarbon standards into external rules and occupy the commanding heights of global technological and trade competition.

Drawing on geography, resources, and power as analytical lenses, this article focuses on Europe's energy supply and use after the outbreak of the Russia–Ukraine conflict. It dissects the core logic behind the EU's energy strategy transition from three drivers: the pursuit of strategic autonomy, global technological competition, and the remapping of critical resources.

2. Factors influencing energy security strategy

Energy security is a complex concept marked by subjectivity, dynamism, and plasticity whose connotations and denotations have been continually enriched and extended by practice. Generally, energy security refers to the stable energy supply needed to keep a country functioning normally[4]. The International Energy Agency defines energy security—across availability, accessibility, and affordability—as "the uninterrupted availability of energy at an affordable price"[5]. This definition was borne out in the Russia–Ukraine conflict: the EU faced a crisis of "availability" due to Russian gas disruptions and pressure on "affordability" as energy prices surged.

Broadly, since the end of the Cold War—and especially since the turn of the 21st century—academic research on energy security has followed two main logics: geopolitics and the free market.

Under the freemarket logic, markets play a foundational role in resource allocation; through building international regimes and improving global markets, interdependence in the energy realm can be achieved. Firms are the primary drivers of energy supply chains. While resources are geographically dispersed according to comparative advantages, global production networks can be constructed through orders, resource allocation, and R&D.

Under the geopolitical logic, energy reserves are viewed as a finite and gradually diminishing strategic asset, and energy access is a security domain colored by a pronounced "zerosum game," becoming one root of interstate competition and conflict. This logic focuses on state power resources in energy security and centers on deployment and control over supply chains to improve states' power advantages against potential risks. With added power and security considerations, it favors enhancing autonomy and control over energy resources and seeking comparative advantages and relative gains: "To ensure their own security and ultimately survive, states should either seek to control the things they depend on or reduce their dependence on other states"[6]. In this vein, states issue policy measures to adjust or remold marketdriven energy layouts.

Based on classical theory and energy geopolitics, this article takes geographic space, resources, and power as entry points to decode the drivers of the EU's energy transition[7]. Geographic space refers to the routes and nodes of energy flows, including crossborder pipeline networks, maritime corridors, and major energy hubs; control over these spatial elements enables influence over supply. Resources span fossil fuels, nuclear, and clean energy. Different energy types vary in reserve distribution, substitution costs, and technical barriers, shaping the foci of geopolitical competition. At present, the locus of contention is shifting from natural gas toward critical minerals. Power is manifested as voice and agency in rulemaking, standardsetting, and interventions along supply chains. Through legislation, international agreements, and investment, the EU expands or consolidates its influence in geopolitical contests.

3. Geopolitical turning point in eu energy transition policies

For a long time, Russia was the EU's largest and most important energy partner, and their mutual energy dependence was a key cornerstone of Eurasian geopolitical stability. In the past, nearly half of pipeline gas to Europe transited Ukraine and Belarus, and Russia's share of EU gas exports once reached 45%. When the Russia–Ukraine conflict suddenly erupted in February 2022, the "convenient energy chain" the EU had built over many years was torn apart overnight.

Nord Stream flows plunged by more than 40% almost instantly, Ukraine transit lines were forced to shut, and by the end of 2023 the share of Russian pipeline gas in EU imports had fallen to 8%. The disruption forced Germany to take emergency steps, including restarting coalfired power plants previously closed for environmental reasons, and pushed Italy, Spain, and others to hastily expand LNG regasification capacity to plug the pipeline gap in the short term. The supply rupture rapidly drove up European gas

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and power prices, with hefty energy bills morphing into broader economic risks: euro area inflation surged to 9.3% in 2022, a postWWII high, sharply raising industrial costs and squeezing margins in downstream sectors such as food and chemicals.

For energy importers, importing energy entails the risk of supply disruption, and high external dependence implies latent security threats[8]. To shed reliance on Russian energy and guard against future supply crises, the EU accelerated both energy security measures and the green transition, initiating dual tracks of emergency response and medium to longterm strategy and moving swiftly to remap the geography of its energy supply chain. Under REPowerEU, the Union pledged to lift gas storage to 90% by 2023, having already surpassed 80% by end2022; Europe's energy trading platform launched new capacity markets and flexibility products to strengthen the grid's resilience to price volatility and supply interruptions.

Marked by the outbreak of the Russia–Ukraine conflict, geopolitical logic supplanted freemarket logic as the dominant narrative of European energy security, and EU and member state policies have shifted from "market reliance" to "state intervention." The EU has come to see energy security not as a mere "supply–demand balance," but as a strategic lifeline tied to sovereignty and regional stability. This shift is reflected not only in emergency measures, but also in the longterm integration of energy policy into geopolitical statecraft. While restoring supply security, the EU has continued to advance the green transition, foregrounding geopolitical security concerns in green energy policymaking in place of prior environmental emphases.

4. Drivers of the EU's energy transition

Driven by the pursuit of strategic autonomy to reduce external dependence, the practical need to restructure economic interests, and the desire to elevate its voice in global clean-energy competition, the EU has accelerated its energy transition policies. These three drivers are logically layered: reducing external dependence and championing autonomy serve as the foundation for survival; securing supply-chain advantages and economic gains constitute the impetus for development; and rule-making and discursive power are the core objectives of geopolitical contestation.

4.1 Pursuit of strategic autonomy by reducing external dependence

The power asymmetry embedded in dependence on Russian energy exposed the EU's passive position in energy bargaining. This dependence eroded the EU's voice in dealings with Russia, making it urgent to break the threat of the "weaponization" of energy via transition, shifting the center of gravity from resource imports to technology and supplychain control to realize strategic autonomy.

To exit dependence on Russian fossil fuels, the European Commission released REPowerEU in May 2022. The plan rests on three pillars. First, energy conservation and efficiency: reduce building energy consumption by 19% by 2025 and install five million additional heat pumps. Second, supply diversification: add ten LNG regasification terminals and raise flows along the Southern Gas Corridor to 24 bcm, lifting gas imports by 60% over 2021 levels in the short term. Third, accelerated deployment of clean energy: add 120 GW of renewable capacity by 2027 and launch pilot European hydrogen corridors with an expected annual throughput of 50,000 tons of green hydrogen[9]. To this end, the EU earmarked €225 billion in rolling allocations from the Recovery Fund to support investments by member states in pipelines, gas, storage, and efficiency retrofits.

At the legal level, the EU has elevated "strategic autonomy" into a hard requirement. The 2021 European Climate Law explicitly incorporated energy security into the climate framework, requiring the Union to reduce external dependence on natural gas to below 50% by 2030 and establishing an annual correction procedure to track member states' energy security progress. In implementation, member states have also integrated joint procurement and reserve mechanisms within the Energy Union. The joint gas purchasing framework launched in autumn 2022 enabled cross-border negotiations to pool terms and pricing for gas procurement for the first time; gas inventories have since stabilized at above 85% across member states.

Through this mix of short and mediumterm emergency tools and longterm institutionalization, the EU has succeeded in cutting its dependence on Russia. These practices show the EU's reframing of energy transition from a climate issue to a survival issue that prioritizes security. The core is achieving strategic autonomy—maintaining independence in energy policy amid geopolitical crises and avoiding shortterm shocks that weaken capabilities due to external causes. By combining measures on pipelines, gas, storage, and legalinstitutional frameworks, the EU not only repaired supplychain rupture risks but also established a new pattern of diversified, reversible, and institutionally guaranteed energy security, laying a stable foundation for subsequent lowcarbon transition.

4.2 Practical need to restructure economic interests

Critical minerals are foundational inputs for manufacturing clean-energy equipment and thus underpin the use and diffusion of clean energy. Given the geographic con-

centration of critical minerals and industrial advantages, a new round of geopolitical competition is emerging. The United States and the EU currently view China as a key competitor in this sphere and have issued a raft of policies to safeguard access to critical minerals. The EU's 2023 Critical Raw Materials Act lists 30 critical minerals, requiring member states and EU bodies to establish minimum stock levels by 2030 and to prioritize investment and administrative support for projects with high supply risk[10]. Through the European Raw Materials Alliance, which brings together more than 3,500 firms and research institutes, the EU uses an industry database, risk-warning mechanisms, and project-matching platforms to monitor global supply risks in real time and activate multilateral cooperation for rapid response amid geopolitical volatility. In remapping the resource landscape, the EU has mobilized government, market, and research to construct new resource zones and seize initiative in the global lowcarbon value chain. The EU has promoted and joined the Mineral Security Partnership, competing with China for resourcestate partnerships through alliancebased cooperation. At the same time, to reduce reliance on certain resource powers—especially to break China's dominance in processing links for lithium, cobalt, and other critical minerals and safeguard its own resource security—the EU has signed bilateral agreements with other countries[11]. Examples include a lithium supply agreement with Australia, discussions with Chile on joint development of cobalt and lithium, and cooperation with Morocco on rare earth refining facilities, with the goal of securing over 25% of the global lithium market within the next decade. This process reflects a "zerosum" mindset: others' control over critical minerals implies a weakening of the EU's own power. Accordingly, strategy around critical minerals is shifting from marketled supply chains into a geopolitical competition framework—closely intertwined with the nature of energytransition policy.

As the world transitions from the fossil era to the clean-energy era, the division of labor from resourceproducing to resourceconsuming countries is giving way to a structure from technologyleading countries to processingdependent countries. To control key links and raise relative gains, the EU has pursued two tracks. Upstream in frontier technologies, policy instruments such as the Green Deal Industrial Plan provide subsidies to bolster domestic R&D, seeking breakthroughs in "chokepoint" areas like electrolyzers and storage systems to secure command over the cleanenergy value chain. On localized manufacturing, the "European Battery Valley" plan has clustered 17 battery plants, aiming for 500 GWh annual capacity by 2030—enough for roughly ten million EVs. The EU has invested €3 billion via Important Projects of Common European Interest, alongside facilities for rawmaterial preprocessing and recycling, forming a closedloop ecosystem. These moves significantly enhance security in green industries while generating economic benefits.

4.3 Elevating voice in global cleanenergy competition

In the context of climate action and economic recovery, green industries—represented by clean energy—are playing an increasingly prominent role in the global economy. With the UN's "Race to Zero" initiative, green growth is flourishing worldwide, and major economies such as India, Japan, the United States, and China have launched incentive programs and development strategies for cleanenergy sectors to enhance their competitiveness in the lowcarbon order. Within this framework, the geopolitical interplay of clean energy has intensified, and tasks such as securing cleanenergy supply chains, claiming dominance in future energy systems, and raising voice in cleanenergy rulesetting have emerged as core national priorities.

In terms of capability, the EU has recognized that controlling the technological value chain of clean energy is essential to reshaping the power configuration. The 2019 European Green Deal not only set the ambitious target of netzero emissions by 2050, but also designated hydrogen, battery storage, and smart grids as strategic R&D priorities. From 2020 to 2022, the EU's public and private R&D spending on green technologies rose from approximately €25 billion to €38 billion, accounting for nearly 20% of the global total, with patent applications increasing by 35% year over year.

In terms of rules, the EU aims to leverage its institutional edge to gain geopolitical power—by leading the creation of global green standards that compel other countries to adopt EU norms. This strategy preserves the EU's hegemonic position as a "rulemaker" in the cleanenergy era. Take the Carbon Border Adjustment Mechanism (CBAM): since its pilot launch in July 2023, it has imposed carbon tariffs on industries such as steel, cement, electricity, fertilizers, and aluminum, covering an estimated 20 million tons of CO_2 equivalents and expected to generate €1.6 billion in its first year. The mechanism not only pressures firms in third countries to invest in decarbonization of production processes but also effectively exports the EU's carbon pricing across the global trade network, making it binding for others.

Similarly, the new Battery Regulation requires carbonfootprint labeling for batteries by 2027; Chinese photovoltaic modules that fail to meet these standards may be excluded from the EU market. In essence, this rule export strategy erodes China's cost advantage in the PV value chain and serves the EU's geopolitical objective of "derisking from

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China." Through embedding environmental standards into global supply chains, the EU transforms these into unprecedented rulebased trade weapons.

5. Conclusion

The EU has advanced along three dimensions—geographic space, resources, and power. The Russia–Ukraine conflict severed dependence on Russian gas, prompting a rebuilding of spatial routes. In contests over natural gas, critical minerals, and hydrogen—resources foundational to clean-energy development—the EU has demonstrated strategic appraisal of resource attributes. Meanwhile, the use of rulebased tools such as the Carbon Border Adjustment Mechanism has transformed achievements in spatial and resource realignment into concrete projections of power.

Following the conflict, the EU's energy transition has moved beyond the prior bounds of climate governance to become a geopolitical contest centered on the restructuring of power. Amid the collapse of the traditional fossilenergy power order, the EU seeks to maintain discursive authority in the clean-energy era through technological monopolies, rule export, and alliancebuilding. In this process, "deRussianization" and "deSinicization" serve as direct security derisking goals; forging technological advantages and securing critical resources are core means; and alliance and blocbased confrontation is the strategic choice. The ultimate objective is to reshape a clean-energy order and institutions favorable to the EU. However, this "zerosum" pathway risks exacerbating global supplychain fragmentation and delaying international cooperation on climate change.

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