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The European electricity market reform: an assessment & next steps

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EXECUTIVE SUMMARY

The functioning of the **European electricity market needs new instruments to encourage investment in large-scale renewable energy projects and storage.** Although in theory markets such as the European could incentivize investment, in practice they have failed to do so. In fact, at a certain point of maturity, the price decline in the electricity markets reduced the incentive for long-term investment in the installation of both renewables and extra capacity with complementary sources (e.g., combined cycle).

In this context, energy shocks such as those of recent years add to this structural problem to underline the high volatility we have in short-term prices when there are strong imbalances between supply and demand for the sources that usually cover when renewables cannot come in.

The **motivation behind the reform** of the European electricity markets is therefore to **re-incentivize the construction of generation capacity** that will allow a more decisive move towards decarbonization **while providing greater flexibility** (both in terms of supply and demand) that can lead to **greater price stability**.

However, although these objectives are shared between countries, the way to achieve them is not, due to the different energy and consumption mixes (industrial and household) at the outset.

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As a result, the outcome is far from those objectives and in its **current form the reform of the European electricity market falls short in several key respects.**

- → First, while recognizing the importance of long-term market-based instruments for renewables, it fails to develop efficient European markets for their integration.
- → Second, contracts for difference, its central instrument, are intended more as government support than as market tools accessible to all stakeholders.
- → Third, the lack of standardization in the capacity and flexibility markets allows member states to design divergent approaches, potentially distorting the European single market.

On the other hand, where the **reform has succeeded is in establishing a common emergency mechanism**, under the supervision of the European Union, and in which potential aid to consumers would be at a flat rate, so as not to distort the price signal (and therefore savings).

Expectations prior to the reform of the European electricity market were perhaps too high, especially considering that the current short-term market design took almost a decade. However, **this reform should be seen as an initial step,** a reflective process that lays the groundwork for a longer development. The **ultimate goal** should be the **creation of a harmonized and long-term focused European electricity market**, a process that requires time and careful consideration in order to achieve effective and coherent integration at the European level.

Introduction

After more than a year of arduous negotiations, the reform of the European electricity market is in its final stretch. After reaching a common position in the European Parliament in July, the member states followed suit in the Council in October, and the proposed regulation is currently in the final phase following the provisional agreement between the Council and the Parliament in December 2023. The three institutions are seeking to reach an agreement that will, on the one hand, boost investment in renewable energies and increase the stability of the cost of energy, and on the other hand, protect consumers against price volatility. The aim is for the reform to be fully passed before the European elections next June.

However, the current situation has led the reform to focus more on responding to immediate circumstances - such as the impact of the gas crisis on electricity prices and the protection of domestic and industrial consumers - than on establishing a solid roadmap to prepare the electricity system for an emission-free economy. Moreover, the initial differences in the positions of the Council, the Commission and the Parliament have highlighted the divergences between the national interests of the member states on both the supply side, energy mix, and demand side, and how they have conditioned this process.

Against this backdrop, this paper starts from the need for this reform to analyze the state it has led to, paying special attention to the political economy surrounding this process, and assessing to what extent the form it has been taking is aligned with the long-term goals of the European Union in energy policy, including the dimensions of autonomy and equity in the impact of the energy transition.

To this end, we also focus on those elements that have been left out of the current proposal and should be addressed in successive revisions to increase the resilience of the electricity system and adapt it to the needs of a decarbonized society. Finally, given that the debate on the electricity market has evolved and over the last year the focus has shifted to the competitiveness of European companies in a context of cross-competition between large economic blocs (EU, USA, China) to combine efficiency and decarbonization, we will offer some reflections on its relationship with the new industrial policy of the European Union.

The departing point: how the market works today

It is crucial to understand the essential features that define the European electricity market and the context in which its current design originated in order to grasp why it may not be sufficient to facilitate the transition to a decarbonized energy system.

The electricity market is essentially a meeting place between buyers and sellers for the exchange of electricity, which includes not only the daily wholesale market but also long-term contracts, complementary markets to adjust generation to demand in real time, such as adjustment and balancing markets, and the retail market, which is responsible for marketing supply to end consumers.

Since the liberalization of the electricity sector in the European Union in the late 1990s and early 2000s, the day-ahead market has been the cornerstone of the system. It operates through an auction that orders the producers' bids in an increasing order of merit until the entire demand is covered. The last technology needed to cover it, known as marginal technology, determines the market price while generators with bids below this price are known as infra-marginal.

Although effective in certain key aspects, such as ensuring efficient operation, it has certain shortcomings as the integration of renewables into the system grows. These sources have marginal costs close to zero once the fixed cost of their installation is assumed. This fact alters the price dynamics and profitability of all technologies. In particular, **displacing fossil fuels in the generation mix lowers wholesale prices** (Gelabert et al., 2011; Würzburg et al., 2013) and **leads to a decrease in the profitability of all technologies, including, paradoxically, themselves through cannibalization and depredation effects** (Peña et al., 2022):

- → Renewables "cannibalize" their own incentives in the marginalist system because they reduce the ratio of income over total electricity generated by them, something that happens to the extent that their greater presence lowers the price of generation.
- → At the same time, the remuneration of other technologies is "depredated" by the same logic, something that especially affects the firm power installed in the system.

Thus, the potential and theoretical incentive for investment in renewables is reduced as these have more weight in the mix and lower prices.

This paradoxical situation causes **two fundamental problems** in the form of unresolved issues:

1. **How to encourage the necessary investments in large-scale renewable energy projects in a context of structurally low day-ahead market prices** (i.e. avoid cannibalization)?
2. **How to incentivize investment in technologies that offer flexibility on both the supply and demand sides**, such as storage or combined cycle plants, which are essential to ensure electricity supply, **but whose revenues, for part of the installed capacity, will not reflect their real value in the wholesale market?**[1] (i.e., solve predation).

To address these challenges, it is essential to **strengthen and improve the design of long-term and flexibility markets**. Despite their potential, these markets are not sufficiently developed and standardized at the European level, and contract terms are often too short to support capital-intensive investments (ACER, 2022). On the other hand, to solve the problem of the lack of revenue from reserve resources, capacity markets or mechanisms have emerged, generally articulated through "capacity payments", which remunerate plants for being available for supply in the event of peak demand. However, depending on their design, they may present certain risks, such as serving as a backup for more polluting technologies in order to guarantee security of supply (Schittekatte & Meeus, 2021; Zachmann & Heussaf, 2023), and also generally over-rewarding the technologies selected for these payments.

In summary, the diagnosis points to a very concrete **challenge**: to **transition to a hybrid system that separates long-term investment decisions from short-term price signals, while ensuring operational efficiency, security of supply and decarbonization** of the energy mix (Joskow, 2019; Keppler et al., 2022).

Motivation for reform: why now

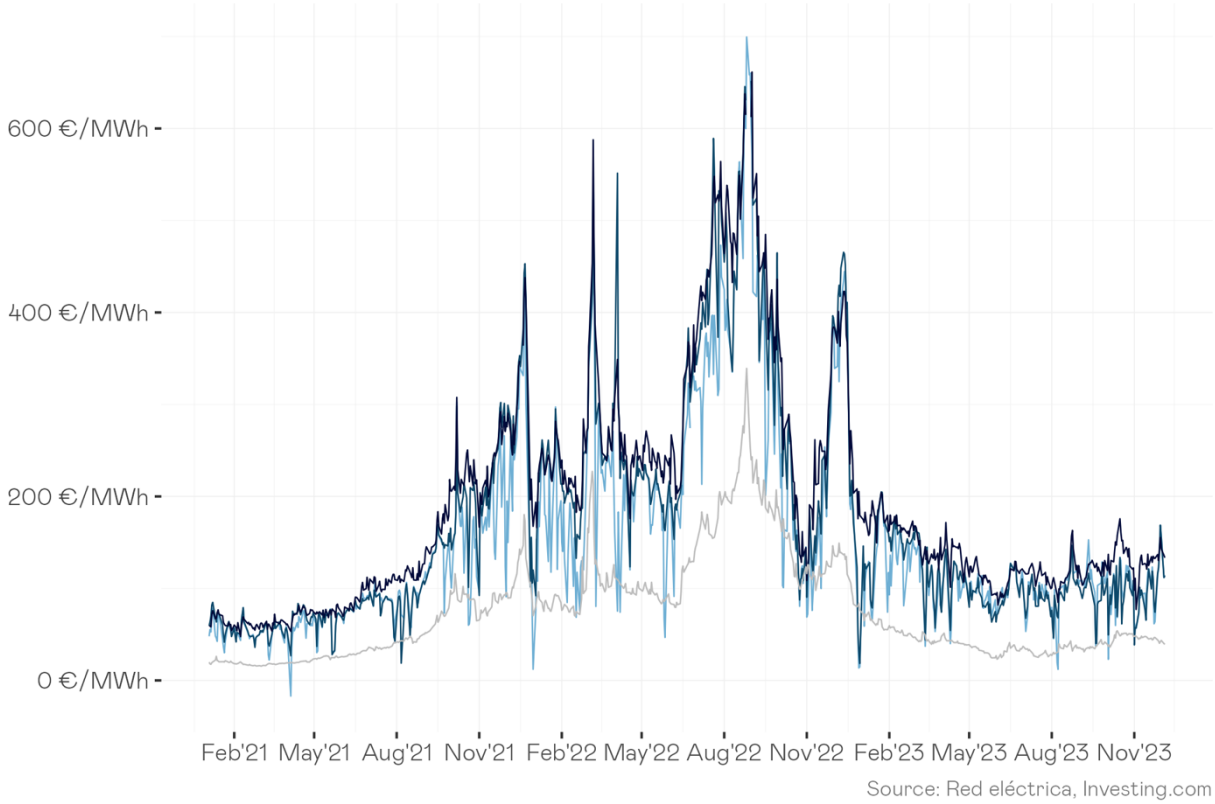
Although the challenges facing the electricity market in the face of decarbonization have been widely discussed in the recent literature (Blazquez et al., 2020; Joskow, 2022; Newbery, 2018; Roques & Finon, 2017; Wolak, 2022), **political interest** in undertaking reform **crystallized** when the **impact of the energy crisis** became apparent in the **economy and population.**

The escalation of gas prices, which began with the post-Pandemic recovery and was exacerbated after the Russian invasion of Ukraine, has pushed electricity prices in Europe to historic highs over the past two years. The relationship between the two energy prices is determined by the presence of combined cycle power plants in electricity generation, which

[1] Some storage will come onto the market through price arbitrage. However, this will not be enough to incentivise investment in sufficient capacity to ensure the long-term reliability of the system.

use gas as an input, and their role as a marginal technology during the hours when renewable production does not meet demand. Moreover, given that, on average, two MWh of gas are needed to produce one MWh of electricity, the electricity market amplifies the effects of a shock in the price of this fossil fuel. Figure 1 illustrates this effect for the main European markets and the reference price of gas in the European Union, the Dutch TTF.

Figure 1. Evolution of wholesale electricity prices in Germany, France and Italy and gas prices in Europe (€/MWh).



The economic impact of this increase in electricity prices has been profound, affecting households and industry, and contributing decisively to unprecedented inflation in the Eurozone. In response, governments adopted various measures including VAT or excise tax reductions on energy products, retail price regulation, transfers to vulnerable consumers, support to industry and taxes on windfall profits[2] (Sgaravatti et al., 2021). But, given the budgetary cost of such policies and their limited scope on the root problem, member states

[2] A side effect of high electricity prices is that they have generated windfall profits for infra-marginal technologies such as renewable energies, hydropower or nuclear power. These "windfall profits" can have a positive impact on investment in these "clean" technologies and help to reduce the market share of gas; however, if there are barriers to entry, they can be converted into market rents. As the penetration of renewables in the system increases, these revenues will decrease and may even turn into losses as the market price does not cover the investment and operating costs (Chaves et al., 2023; Fabra, 2022).

showed in parallel a renewed interest in revising the design of the electricity market, seeking to decouple the price of gas from that of electricity and to increase consumer protection.

Against this backdrop, it is worth noting that, **although electricity prices have risen significantly over the last two years, this does not necessarily indicate a flaw in the design of the day-ahead market**. On the contrary: it has functioned as expected, efficiently transmitting price signals to consumers and producers, and reflecting production costs and resource scarcity, in this case gas. As the share of renewables and storage grows in the energy mix, gas will lose its role as a marginal technology. Consequently, this motivation to reform the market to decouple its price from that of electricity will disappear (although the need for reform to decarbonize will persist).

Moreover, as noted above, in a fully decarbonized electricity system, short-term wholesale market prices will generally be low. However, the **current situation reflects the challenges we may face during the transition** to this system. As clean energy deployment increases, short-term price volatility will intensify, experiencing very high prices at times of scarcity and extremely low prices at other periods (Chaves et al., 2023).

Thus, with all these elements, the Commission's proposal[3] focused on two central goals. First, how to send the right signals to encourage investment in emission-free technologies while preserving efficient operation in the short term. And second, how to protect consumers from increases in price volatility during times of crisis such as the recent one. Although there is a consensus among academics and industry professionals on these goals, this consensus is diluted when considering how to implement them in practice.

The different positions and the foreseeable final agreement

Focusing on the first goal, economic theory offers two main approaches to reconcile efficient short-term operating signals with long-term investments.

On the one hand, the **centralized planning approach** is based on the state or the regulator determining the necessary investments, remunerating them at a fixed price and relegating the operating signals to the day-ahead market. Private agents compete for the market, i.e., to build and operate the various generating plants. **Contracts for Difference (CfD)** have become the reference option within this approach, acting as insurance for renewable energy producers against price fluctuations, assuring them a minimum income: they consist of agreements that allow energy producers to sell their production at a fixed price, regardless

[3] See Comisión Europea (2023) in the references.

of variations in the market. Under a CfD, the producer receives the difference between the market price and this agreed price (strike price) if the market price is lower, thus ensuring a minimum income. Otherwise, if the market price is higher than the agreed price, the producer pays the difference. This provides significant financial stability for renewable energy projects, allowing them to compete more effectively in the market and reducing the financial risk associated with price fluctuations. Although they have become benchmark options for the centralized approach, as pointed out by Chaves et al. (2023), CfDs do not necessarily need to be regulated or offered centrally, they can be standardized and offered on European platforms similar to the day-ahead or intraday market.

On the other hand, the **market approach** relies on private agents to make investment decisions, supported by sufficiently developed long-term and capacity markets that complement the short-term market. Here, **Power Purchase Agreements (PPAs)** are the main instrument. These are contracts between generators and consumers at a price agreed by both parties, which can be physical or financial, and which ensure stable revenue streams for renewable projects.

Each approach has its own challenges (Chaves et al., 2023). Centralized planning may lead to overinvestment and a slower transition to efficient technologies, while the market approach may face barriers in the development of long-term markets and risks of price distortion.

In terms of instruments, **both CfDs and PPAs, while useful, are not without risk** (Zachmann et al., 2023; Zachmann & Heussaf, 2023). The former, if not properly designed, can create operational distortions and, in an inflationary environment, set prices inefficiently high. Moreover, if decision making rests with member states, it can lead to disparate outcomes limiting the integration of EU electricity markets. PPAs, for their part, are not standardized and can be rigid, making it difficult to adapt to changes during the life of the contract. Finally, small and medium-sized companies have problems in accessing these agreements as renewable energy producers prefer companies with large financial capacity as counterparties.

Considering the shape of the reform, which started from contracts for difference as the only form of public incentive for investment in emission-free technologies and emphasizes the development of long-term markets and access to PPAs, **it was to be expected that the debate would have focused on the preferences and reluctance of member states regarding the degree of intervention in the markets and the advantages and weaknesses of these instruments.** Countries such as Germany and the Netherlands were more reluctant to intervene in the markets during the energy crisis, compared to Spain, Portugal and France (Taylor, 2021). **However**, as we will see, their **positions** on the form the electricity market should take are **closer to their national interests in terms of the direction European energy and industrial policy can take**.

These **interests are intrinsically linked to supply factors, the current and future energy mix of each country, and its demand structure, the importance of the industrial sector.** If we consider the composition of generation, France, for example, is highly dependent on nuclear energy, about 70% of its electricity is supplied by this technology, while Germany has closed all its nuclear power plants and Spain obtains half of its electricity from renewable energies. This dependence on and future commitment to nuclear power has led France to lead an alliance with 13 other countries, including Poland, Belgium and Sweden, with the aim of giving nuclear power, either with existing plants and their extensions or future plants, access to CfDs. This initiative faced opposition in the Council from other member states, led by Spain and Germany, reluctant to the development and use of this energy for decarbonization and considering that this instrument should be reserved for new installations, in the case of Germany, adding concerns about industrial competitiveness (Hancock, 2023).

Industry accounts for 40% of electricity consumption in Germany, compared to 30% in Spain and 25% in France. Moreover, this sector plays an essential role in the economy, contributing 20%, 12% and 11% respectively to the added value of each country. The competitiveness and production of electro-intensive companies is closely linked to electricity prices. The German government feared that France would use the CfD revenues from its nuclear fleet to distribute them to its consumers, including industrial consumers, without having to be subject to state aid rules. This would give the Gallic country a competitive advantage that could ultimately attract companies from Germany (Chazan et al., 2023).

Finally, after months of negotiation, the agreement reached in the Council[4], under the Spanish presidency, allows nuclear power plants to benefit from this form of public financing, but assigns to the Commission the task of ensuring that the distribution of revenues does not distort competition in the internal market. In this way, the demands of both blocs were met. However, a month after the agreement was reached, France announced its new proposal to regulate the price of nuclear energy (ARENH) from its state-owned utility EDF. According to the agreement reached with this company, the price of electricity generated with the nuclear fleet will be increased from €42/MWh to €70/MWh. In addition, it will allow the government, when the market price exceeds a certain threshold, to redistribute revenues directly to households and businesses. The objective would be to avoid the supervision of the European Commission associated with the distribution of revenues from contracts for difference (Leali, 2023). However, this new framework seems to be more beneficial for nuclear generators than for consumers who could face higher prices.

With all these elements, **the final result of the reform agreed between the Council and the Parliament last December is close to the demands expressed by the member states and embodied in the Council's proposal**. In relation to CfDs, these or similar schemes with the same effect may be applied on new investments in renewable and nuclear plants. On the other

[4] See Council of the European Union (2023) in the references.

hand, another conflictive point of the Council's proposal has also been maintained: the temporary elimination of emission limits for fossil fuel plants to access capacity mechanisms until 2028. However, the conditions for applying this exemption will be stricter and the Commission will have to assess the impact it would have on emissions.

As this analysis shows, the **process of electricity market reform in the EU** has reflected the political economy of the region and how, at times, this **relegates to the background the achievement of climate objectives and the advancement of a resilient system** adapted to the reality of an emission-free generation structure.

Is the reform aligned with long-term decarbonization goals?

In reality, and as mentioned above, this reform can be considered a non-reform in that **it does not align the structure of the European electricity market with the needs of a system with a high penetration of renewables.**

No-reform because, in reality, **it does not introduce any substantial modification or new instruments over the existing ones**: PPAs, CfDs (the basis of the recent renewable auctions in Spain) already existed; nor does it create new platforms or structures for the promotion of long-term markets (virtual forward hubs have a very limited trajectory). This is not negative in all aspects: **fortunately**, and despite the fact that some countries wanted to eliminate it, **the short-term market is maintained as the backbone of the system**, the source of operating signals and efficient exchange.

But, as we have said, **the long-term markets at European level needed to invest in renewables and integrate them efficiently into the system are not really developed. Nor are standardized products** being considered at **European level**, which should form the basis of the future long-term market. And **contracts for difference** continue to be considered more as **support instruments by governments** than as a long-term contracting tool accessible to all agents.

Nor are capacity markets standardized, thus opening the door to different designs by Member States. In this sense, and although it is true that the reform does not make any explicit decision, by omission it does transfer to the member states much more decision-making capacity over the long-term mix, and therefore creates many more possibilities for distortion of the single European market.

Another area where the reform has **gaps** is in the **design of the flexibility markets**, which are also still left to the Member States, despite the obvious synergies that would arise from shared flexibility between interconnected regions.

Moreover, both capacity and flexibility markets are subject to multiple restrictions and authorizations. This surely reflects DG Competition's concern to minimize the aforementioned distortions; but it would have been much more interesting to define a homogeneous scheme at European level, which would not create distortions in the single market, and which all countries would have been able to apply directly.

In view of all these problems and limitations of the reform, it must be said that **it was difficult to reconcile the political urgency** that some states in particular had to approve this reform (and sell it to their supporters) **with the time needed to develop a market on a European scale**. The implementation of the European short-term electricity market has taken a not inconsiderable amount of time, more than 10 years, so miracles were not to be expected either. **Rather**, and in this we hope, **this reform should be seen as a first reflection, opening a long-term process** that will culminate in the design of a true long-term electricity market harmonized at European level.

Where the **reform has succeeded is in establishing a common emergency mechanism, under the supervision of the European Union**, and in which potential aid to consumers would be at a flat rate, so as not to distort the price signal (and therefore savings).

Industrial policy: an opportunity to decarbonize the European mix?

Until recently, European industry relied on the purchase of energy at affordable prices to maintain a degree of competitiveness (Zettlemeyer, 2023). But the price escalation from 2021 and especially 2022 with the failure of Russian supply to the east and the center of the continent (German industrial engine included), withdrew this support. As we highlighted above, the day-ahead market worked as expected: transmitting the price signal. And it is implicit in the logic of decarbonization that this will continue to be the case. The same internalization of the price of the negative externality of emissions, and the subsequent price discrimination towards decarbonized sources, is expected from large consumers as from small ones.

This **new world thus aspires to deliver on the promise of affordable, secure** (i.e., autonomy-guaranteeing), **clean and stable energy supply** to underpin our future competitiveness. **But the road to decarbonized value chains will inevitably be a long one**: in addition to the change in the mix and the building of capacity and stability that the (as we have seen, insufficient) current reform was aimed at, there are the issues of storage, distribution and interconnections to condition the transition. But even leaving aside these more technologically (and politically) significant challenges, **the exit from the reform process underscores the EU's continuing failure to produce a supranational solution that would**

allow it to take full advantage of the economies of scale that could result from more coordinated action. This would be true regardless of the degree of public/regulatory presence that is decided for such a solution: it is true that a solution too centralized in a single decision-maker or group of decision-makers would put Europe at greater risk of capture by its industrial sectors with greater access to decision-making; and it is also true that if the solution is too rigid in the definition of the technologies chosen (with the idea of reducing this risk of capture, at least partially) the capacity to respond to short-term shocks is reduced. But these are marginal remarks: **as long as coordinated European long-term markets are not developed, the differences between states and regions will continue to define the resulting equilibria**, as we have seen in previous sections.

The political cycle of market reform will run out in these months, but a new one will start after the mid-2024 elections and the subsequent reconfiguration of the Commission. One of its central components will most likely be a push for European industries, precisely in response to the green industrialization pushes we have seen in the US and China in recent times. It is therefore worth concluding this reaction by exploring at least some of the possibilities that are opening up.

Contrary to what may appear at first glance, not all of these possibilities need to be protectionist in root. For example, Sgaravatti et al. (2023) consider moving in the opposite direction: **outsourcing in a much more diversified way than at present those parts of the chain that provide low value added but are highly energy intensive**. Provided it is done strategically, this approach would reduce European energy dependence: it would involve relocating specific industrial processes to regions where operational efficiencies can be maximized, while preserving the higher value-added parts within European borders.

However, this would require careful planning and execution, as well as strong transnational coordination to ensure that the benefits are equitable: the value added of these parts of the chain may be low in aggregate, but will be very high in those parts of Europe where they generate considerable employment. Moreover, there would be a clear risk that we would simply end up not only displacing emissions but increasing them if there is no effective monitoring of the emissions associated with each imported intermediate good. The CO_2 border tax (CBAM) recently implemented in the EU is the tool of choice for now to avoid this risk of carbon leakage, but as we have already seen in Linares (2022) there are reasons to doubt that monitoring can effectively detect all associated emissions in third countries with the (relatively few) instruments currently available to the EU institutions.

Another complementary alternative, discussed (e.g., in Sgaravatti et al), would be to **gradually facilitate the development of energy-intensive industries in areas with comparative natural resource advantages for renewable generation**. This possible partial reconfiguration of the European energy-industry map, as labeled by Sgaravatti et al, could weigh especially heavily as long as the technological challenges in energy storage and

distribution remain unresolved. This approach would realize the benefits from the outset, increase efficiency and reduce energy costs.

Undoubtedly, both the replacement of energy-intensive goods production (however low its added value may be, it will be concentrated in certain regional locations exposed to replacement) and the concentration of industries in specific areas would end up generating regional "winners" and "losers". The aim should be for these winners to be different from those who have been winning so far: properly targeted, this strategy would not only boost decarbonization, but also offer economic opportunities in southern European regions that on average enjoy lower GDP per capita, higher unemployment, and little prospect of taking advantage of the energy transition except for these comparative advantages. Resistance could arise from more developed or "incumbent" regions, which could see their current advantages for the accumulation of energy-intensive industries threatened.

These ideas represent in any case only a starting point for future explorations. As can be seen from the current assessment of the reform, there are still important steps to be taken. These preliminary proposals will need to be analyzed and developed in the next steps, taking into account both their potential benefits and the challenges and resistances that might arise. The continuing evolution of the European energy market will require constant analysis and adjustment of these strategies.

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