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TOWARDS EFFICIENT EUROPEAN HYBRID ELECTRICITY MARKETS: THE EUROPEAN COMMISSION'S ACCEPTANCE OF LONG-TERM CONTRACTS TO ENSURE INVESTMENT IN LOW CARBON GENERATION

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Abstract

Long-Term Contracts (LTC) assume an increasingly important role in European electricity markets as they advance towards comprehensive decarbonisation while ensuring the security of electricity and energy supplies. This follows the recognition that the energy-only markets (EOM) based on short-term marginal cost pricing, which were favoured by the European Commission (EC) and European member countries after the energy market liberalisation of the late 1990s, regularly fail to incentivize adequate levels of investment in low-carbon generation. Previously viewed with caution due to potential anti-competitive effects, long-term contracts are now recognized for their capacity to provide price and revenue stability, key factors in facilitating large-scale investment in capital-intensive low carbon technologies. This paper analyses the gradual evolution of the views on electricity market design at the level of the European Commission. Shifting from a predominantly competition-focused perspective to a broader view, recent regulatory provisions now explicitly include long-term contracts. Notably, mechanisms such as Contracts for Difference (CFD) and Power Purchase Agreements (PPA) have become central to supporting investment in renewable energy and nuclear energy, as they provide partial or complete hedges against price and quantity risks and thus ensure more predictable revenue streams. Recent EU regulations, including Directive EU/2024/1711 and Regulation EU/2024/1747, embed long-term contracts into the EU's regulatory framework, reflecting a more nuanced stance that balances a concern for market competition with a need for long-term investment in clean energy. Tracing this regulatory evolution, the paper also sheds light on the likely future trajectory of EU energy market governance that is likely to preserve a central role for different forms of long-term contracts in the simultaneous pursuit of market efficiency, energy security, and climate commitments.

Introduction

As the global push for deep decarbonisation intensifies, there is a growing consensus that energy-only markets (EOMs), which primarily rely on short-term price signals, are insufficient for guiding investments toward an optimal generation mix (Keppler et al., 2022). These markets fall short in offering the necessary long-term coordination, creating a gap between market incentives and decarbonisation goals. In response, ad hoc measures are often implemented to temporarily address this discrepancy. However, such remedies, while effective in the short term, act as isolated adjustment mechanisms that often overlap with existing tools, leading to policy fragmentation (Roques and Finon, 2017).

The topic of this paper is closely related to Roques and Duquesne (2024), "The Return of Long-Term Contracts in Electricity Markets: Implications for Competition Policy", which first highlighted the evolving role of Long Terms Contracts (LTC) in the European electricity market. Historically, LTC were viewed with scepticism by competition authorities due to their perceived potential to undermine market competition, especially during the liberalisation era when market restructuring sought to break up vertically integrated monopolies. As Roques and Duquesne (2024) outline, LTC were considered a barrier to competition as they could foreclose market opportunities for new entrants and reduce liquidity in spot markets. The present paper complements and amplifies their findings, focussing on investment in low carbon generation capacity rather than competition policy.

The shift reflects a change in policy priorities. The energy transition together with the need for massive investments in capital-intensive clean technologies require a reassessment of the role of LTC. The latter are now considered essential tools for managing risks and securing the financing necessary to support the deployment of renewable energy. This shift reflects a broader change in policy objectives, where the need

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for long-term price stability and coordination of investment in infrastructure is increasingly prioritized over concerns about market competition. Moreover, LTC help mitigate the volatility of energy prices, which is crucial in a market where renewables, with their low marginal costs but high capital requirements, are becoming more dominant. By integrating the insights from Roques and Duquesne (2024), this paper aims to further investigate how LTC can balance the twin objectives of deep decarbonisation and security of energy supply in the context of the European Commission's (EC) evolving approach. While previous regulatory frameworks may have limited the role of LTC due to competition concerns, the current energy landscape with its emphasis on renewable energy investment necessitates a more nuanced and supportive stance towards LTC. In particular, this paper will analyse how LTC can act as risk-sharing mechanisms that ensure stable revenue streams for investors while facilitating the transition to a low-carbon energy system.

The historic stance of the EU Commission vis-à-vis, which for instance had always accepted long-term, out-of-market pricing arrangements for variable renewable energies such as wind and solar PV, was characterised by incompleteness, inconsistency and incoherence, which exacerbated regulatory uncertainty for investors. Piecemeal solutions, such ad hoc exemptions from state aid rules added further layers to an already complex policy mix. Beyond the general challenge of investing in capital-intensive technologies in market bound to become more volatile due to the variability of wind and solar PV generation such contradictory signals further deterred investment in sustainable energy. As a result, this created a further need to for public interventions aimed at aligning energy policies with broader political and societal objectives.

To address these challenges and to avoid a vicious circle, where increased investor uncertainty and increased public interventions feed on each other, hybrid market frameworks have emerged as the market deign of choice to combine short-term pricing for competitive dispatch with transparent forms of central coordination for long-term investment. Hybrid markets specifically aim to reduce investor risks through technology-specific forms of LTC, which act as risk-sharing agreements between investors, electricity consumers and taxpayers represented by the government or public counterparties. Hybrid electricity markets with a capacity mix that is partially or wholly determined by political and societal preferences with the relevant investment incentives to boot thus offer a more convincing path towards ensuring the security of electricity supply while radically reducing the carbon intensity of the European generation mix (Keppler et al., 2022).

The systematic de-risking of private investments in low carbon generation ensures that market dynamics and public policy choices thus cooperate in achieving the optimal generation mix necessary for a sustainable energy future. In this context of the energy transition, LTC play a pivotal role in securing price and revenue stability for renewable and low-carbon energy projects. Among the various forms of LTC, the two most important forms alongside Feed-in Tariffs (FIT) for variable renewables are Contracts for Difference (CFD) and Power Purchase Agreements (PPA).

As the global energy transition continues, the need for massive capital investments to meet decarbonisation objectives is becoming increasingly clear. This has highlighted the disconnect between short-term price signals in liberalised markets and the long-term certainty required to support low-carbon energy projects. This paper investigates the evolving role of long-term contracts (LTC) in this context. It argues that while energy-only markets have historically been insufficient in providing long-term investment stability for renewable projects, the European Union (EU) has gradually recognized the necessity of LTC as indispensable tools for achieving decarbonisation goals. The paper further explores how the European Commission's regulatory frameworks, which were initially focused on promoting competition, are evolving to incorporate the stability that LTC offer. This shift marks a notable departure from the historical stance previously adopted by the EC, which tended to view LTC as potentially harmful to competition. Today, the pro-competitive benefits of LTC, particularly their ability to facilitate investment in capital-intensive and clean energy technologies, often outweigh the adverse effects they may pose to competition. This transformation in policy stems from the recognition that the electricity sector operates under different objectives, technological constraints, and market structures than those observed in the immediate aftermath of market liberalisation.

Contracts for Difference (CFD)

Contracts for Difference (CFD) are financial agreements between an electricity generator and a governmental entity or regulatory authority. Rather than involving physical delivery of electricity, a CFD is a financial settlement, based on the difference between the reference market price and the fixed strike price, possibly determined through competitive bidding processes. When the market price falls below the strike price, the government compensates the generator for the difference (payout). Conversely, if the market price exceeds the strike price, the generator returns the excess to the government (clawback) (European Commission, 2023a). CFD thus ensure price certainty for generators by shifting price risk to the public entity or regulatory authority acting as counterparty. The latter is backed either by taxpayers or by electricity consumers through an apportionment mechanism that results in a fixed levy on each kWh sold in the entire market.

Power Purchase Agreements (PPA)

Power Purchase Agreements (PPA) are long-term bilateral contracts between an electricity producer and an individual customer. Under a PPA, the producer agrees to supply a predetermined amount of electricity at a fixed price, offering financial stability for both parties over the contract's duration (European Commission, 2023a). PPA are instrumental in reducing market exposure for generators while securing a stable energy supply for consumers.

PPA are, in principle, bilateral contracts between individual parties. Nevertheless, the importance of public governance in coordinating the use of such long-term instruments cannot be overstated (Roques and Finon, 2017). PPA thus rely on governments and regulators to provide the relevant regulatory framework. Once instituted, they offer structured

hedging, allowing both producers and consumers to manage financial uncertainties by agreeing on fixed prices and quantities over the duration of the contract, usually several years, which facilitates the financing of capital-intensive low carbon-projects. These benefits are not limited to generation proper but can also support investments in demand-side response and storage.

Consequently, the EC has re-evaluated its position on LTC, now recognizing these contracts as essential tools for coordinating long-term investments, particularly in renewable energy projects. LTC are increasingly viewed as key mechanisms for de-risking investments and ensuring the financial viability of capital-intensive clean technologies, while also contributing to efficiency gains across the energy sector.

This paper aims to explore the critical role of LTC in supporting the deployment of renewable energy within the European Union. A specific emphasis is placed on the legal and regulatory frameworks that have emerged following the liberalisation of energy markets. By examining the evolving legal approach adopted by the EC, this paper analyses how regulatory stances have shifted in response to the changing energy landscape. The discussion will trace these developments from the post-liberalisation period to the present day, shedding light on how these regulatory adjustments have influenced the integration of renewable energy sources.

Through a detailed exploration of the EC's evolving strategies, this paper seeks to provide insights into the future of energy market governance within the EU, particularly in relation to decarbonisation and market competition. It will also assess the broader implications of these regulatory changes on the future trajectory of energy market design, as well as the coordination of investments in low-carbon technologies.

Following this introduction, the paper is structured as follows: Section II examines the historical role after market liberalisation, highlighting how LTC have been perceived by competition authorities and how they have been adapted according to changes in the market structure, ultimately balancing the need for competitive markets with the need for stable, long-term energy investments.

Section III focuses on the main concerns arising from LTC, particularly market foreclosure and liquidity reduction. The 2007 Energy Sector Inquiry was pivotal in highlighting these risks, leading to reforms aimed at curbing market dominance and enhancing competition. While LTC offer benefits such as price stability and investment security, the Commission employs a case-by-case approach to assess potential anti-competitive effects. This flexible, yet non-standardized, framework continues to evolve as the Commission seeks to ensure both market efficiency and long-term consumer welfare in a changing energy landscape.

Section IV outlines the growing recognition of the role of LTC as essential instruments to support both decarbonisation and market stability. As the Europe Union integrates increasing amounts of variable renewable energies (VRE) into its electricity mix, issues such as price and volume risk have emerged, which hamper investment in capital-intensive low carbon technologies such as nuclear, hydro, wind or solar PV. In the presence of such risks, all forms of LTC are perceived as helping to stabilize returns for investors by offering price stability and, depending on the nature of the contract, also quantity stability. However, as bilateral PPA essentially only offer an additional option for allocating price and volume risks between participating parties, their power of transformation may also be limited in electricity markets exposed radical uncertainty such as regulatory or geopolitical risk. This can make government-backed instruments such as CFD and feed-in tariffs (FIT) more attractive for ensuring long-term price and revenue stability. Recognising the value of both instruments, the EC has made significant changes to the working of electricity markets by amending Directive EU/2024/1711 and Regulation EU/2024/1747, which were introduced to promote the adoption of LTC to foster investment in low carbon technologies. The Conclusion, Section V, summarises the findings and closes the paper.

Section II : Issues Surrounding Long-Term Contracts after Market Liberalisation

The liberalisation of energy markets, particularly within the European Union, has introduced considerable complexities in balancing the objectives of market competition with the essential requirement for sustained investment in energy infrastructure. Historically, LTC have been regarded as potential barriers to competition, particularly as markets have transitioned from vertically integrated monopolies to more open and competitive frameworks. During the market liberalisation processes of the 1990s and 2000s, regulators and competition authorities approached LTC with a high degree of caution. Their primary concern cantered on the potential for these contracts to replicate the effects of vertical integration by enabling dominant market actors to consolidate their positions. By effectively securing demand, LTC have the potential to establish significant entry barriers for new market participants, and it would, in turn, contradict the fundamental objectives of liberalization, which aimed to dismantle monopolistic structures, encourage competition, and expand consumer choice within the energy market. However, recent developments, particularly concerning the goal of achieving higher penetration of renewable energy, have prompted a shift in the European Commission's stance on LTC. The Commission acknowledges that, although LTC may pose potential anti-competitive risks, they also serve as essential mechanisms for securing the financial viability of capital-intensive projects, which is crucial for the large-scale deployment of renewable energy sources.

This section explores the trade-offs between the anti-competitive risks associated with LTC and their function in fostering market stability and investment. This discussion underscores the necessity for a more nuanced regulatory framework that would allow policymakers to balance the promotion of market competition with the need to secure long-term investments essential for achieving ambitious decarbonization objectives.

The Trade-Off between Competitiveness and Investment with Long-Term Contracts

The liberalisation of the energy industry during the 1990s and 2000s was marked by a concerted effort from competition authorities to disaggregate the vertically integrated segments of generation, transmission, distribution, and supply, with the aim of enhancing competition reducing the risks associated with monopolistic control. This perspective was reflective of the prevailing market structures, which prioritized the disaggregation of the electricity sector's value chain and regarded long-term contracts as impediments to fostering short-term competitive improvements (Roques and Duquesne, 2024). In the aftermath of unbundling reforms, the EC emphasized the anti-competitive risks posed by LTC, leading to a reinforced antitrust enforcement framework that, since the early 2000s, has systematically integrated concerns over the competitive impacts of LTC into a regulatory approach focused on market development through stringent antitrust protections (European University Institute, 2024a). However, regulatory uncertainty persisted, largely due to the lack of a standardized methodology for evaluating LTC, which created ambiguities in implementation and market operations. Additionally, the post-liberalization market structure was characterized by demand inelasticity and substantial investment demands, further complicating the dynamics of the energy sector. Within this uncertain environment, LTC gained favour among wholesale market participants offering financial and operational stability (De Hauteclocque, 2009). Consequently, LTC emerged as a complementary mechanism, enabling market participants to balance short-term market fluctuations with the long-term predictability necessary for substantial capital investments.

Competition Concerns in Long-Term Contracts

The main competition concerns associated with long-term contracts have revolved around market foreclosure and the potential impact on the wholesale spot market.

- Market Foreclosure: When a significant share of demand is secured through long-term agreements, it can restrict market access for new entrants (Roques and Duquesne, 2024). This situation can reduce consumer welfare, as potential entrants offering more competitive options may be unable to gain market share. As a result, consumers may be deprived of access to potentially enhanced services or more favourable pricing that new players could introduce (De Hauteclocque, 2009).

- Loss of Spot Market Liquidity: Spot markets, by nature, inherently depend on a high transaction volume to foster transparency, liquidity, and stability, all of which are essential for promoting competitive dynamics. However, if a substantial portion of electricity generation is tied up in bilateral agreements through LTC, the number of trades in spot markets declines. A reduction in trading volume can heighten market volatility and undermine the efficiency of competitive wholesale markets (Roques and Duquesne, 2024), consequently driving participants toward the stability and predictability offered by LTC (De Hauteclocque, 2009).

In this context, enforcing competition law within the electricity markets presents significant challenges, given the broader complexities of market dynamics. While the EU has aimed to enhance market efficiency and encourage investments, overly stringent enforcement of competition law could undermine these objectives.

Long-Term Contracts as Tools for Stability and Efficiency

While long-term contracts have the potential to act as a substitute for vertical integration, their effects on market competition understood as a dynamic process rather than as a static equilibrium are not uniformly negative. Indeed, LTC can play a crucial role in enhancing overall market efficiency.

- Risk Hedging: LTC are instrumental in hedging risks for both buyers and sellers by enhancing the predictability of revenues and expenses. Although LTC structures may vary, these bilateral agreements typically entail the exchange of a fixed quantity of output at a pre-determined price (Roques and Duquesne, 2024). For buyers, this stability improves business predictability, making investments in electrification and decarbonization more appealing due to predictable energy costs. For suppliers, the certainty provided by LTC reduce capital costs and encourages investment, particularly in periods of spot market price volatility. These pro-competitive effects of LTC can lower barriers to entry and encourage market participants to engage long-term investments, especially in high fixed-cost technologies where price and quantity risks are considerable. (Roques, Newbery, and Nuttall, 2008).

- Contributions to Long-Term Generation Adequacy: Another significant advantage of LTC is their contribution to long-term generation adequacy by aligning investment decisions between buyers and sellers. LTC provide a framework for efficient investment coordination, enabling both parties to make harmonised, long-term decisions that support infrastructure development and fuel mix diversification (Roques and Duquesne, 2024). Particularly, LTC are essential for project financing structures that require secure long-term fuel supply and dispatch agreements, fostering competition by facilitating market entry and financing low-carbon projects (De Hauteclocque, 2009).

- Mitigating Market Power Abuse: LTC also play a role in reducing market power abuse in wholesale markets by limiting the incentives for dominant players to manipulate prices. Specifically, LTC reduce the likelihood that a dominant market player would withhold capacity to inflate prices, as any increase in spot market prices would only benefit the portion of their supply not covered by contracts (Allaz and Vila, 1993). This dynamic can lead to a greater volume of electricity being traded in spot markets, particularly when supply concentration is low, thus diminishing the market dominance of a few key players (Roques and Duquesne, 2024).

The function of LTC within energy markets is intrinsically complex, encompassing both competitive concerns and considerable market benefits. While these contracts can reinforce market dominance and constraint liquidity in spot markets, they simultaneously offer substantial advantages, particularly in terms of risk mitigation and fostering stability for long-term investments. Effective regulation must

safeguard against market abuse while also recognizing the positive contributions that LTC can offer to energy security, investment, and the achievement of decarbonisation goals.

With the evolution of energy markets, the regulatory approach to long-term contracts has also adapted, recognizing their potential in promoting stability in energy investments. The following section explores how the EC has adapted its legal and regulatory frameworks to reflect the changing role of LTC in a decarbonising energy landscape.

Section III : The European Approach Towards the Legal Assessment of Long-Term Contracts

The European Commission has consistently demonstrated a strong commitment to fostering competitive markets, particularly within the electricity sector. While maintaining its focus on market efficiency, the Commission has adopted a pragmatic, case-by-case approach that reflects the complexities and evolving demands of electricity market liberalization. This adaptive regulatory strategy underscores a shift in the Commission's legal perspective on long-term contracts, from a predominantly competition-centric view to a more comprehensive understanding of their importance in facilitating long-term investments.

In its efforts to balance the promotion of competition with the imperative of energy security, the EC has displayed adaptability in its regulatory decisions. However, this approach has also highlighted challenges, particularly regarding consistency across varied market contexts. This section explores how the Commission's regulatory approach has evolved to balance competition concerns with the need for stable LTC to support renewable energy investments.

Developments in Competition Law Concerning Long-Term Contracts

Long-term contracts within the European Union are governed by legal provisions established under Article 101 and Article 102 of the Treaty on the Functioning of the European Union (TFEU). These articles are rooted in Article 81 EC and Article 82 EC, which provide the legal framework for prohibiting anti-competitive agreements, restrictive practices, and the abuse of dominant positions within the market (Consolidated Version of the Treaty on the Functioning of the European Union, 2008). Specifically, Article 101 TFEU prohibits agreements between companies that may restrict competition, while Article 102 TFEU addresses the abuse of a dominant position in the market.

Together, these articles provide a comprehensive legal framework designed to safeguard competition by establishing market share thresholds that identify situations requiring regulatory scrutiny. This setting enables competition authorities to prioritize enforcement efforts on potential violations, thereby enhancing predictability for market participants while maintaining a robust level of competition oversight.

The European Commission has focused its in-depth investigations primarily on contracts that present potentially anti-competitive risks that could disrupt the market's development. The decision to investigate largely depends on the market shares of the contracting parties involved (Roques and Duquesne, 2024). Vertical restrictions imposed by LTC can be particularly problematic when they distort horizontal competition, prompting EC intervention if the contracting firm holds significant market power. In such cases, market share serves as an indicator of dominance, albeit an imperfect one. Nonetheless, it remains an efficient and straightforward tool to gauge market foreclosure risks (De Hauteclocque and Glachant, 2009).

The EC's guidelines suggest that LTC involving a market share below 15%, or those between 15% and 30% with a contract duration of less than five years, fall within a «safe harbour» and typically do not warrant EC scrutiny (European Commission, 2014). For contracts where market share exceeds 30%, the EC undertakes a more detailed assessment, examining the market structure, the position of the parties, the portion of demand covered by the contract, its duration, the overall market share involved, and the potential efficiency gains (De Hauteclocque, 2009).

The EC has also stipulated that certain contract clauses, such as unclear termination rights, exclusivity, fidelity rebates, and tacit renewals, are almost never acceptable when implemented by dominant firms. If a contract surpasses the 30% market share threshold and lacks these prohibited clauses, the EC proceeds to evaluate its anti-competitive effects. Generally, firms with low market shares are unlikely to distort competition to the extent that requires full-scale intervention. However, when market shares exceed 30%, the analysis enters a grey area, requiring consideration of multiple factors to determine the contract's competitive impact (De Hauteclocque and Glachant, 2009). Only when there is significant concern that the LTC might cause substantial anti-competitive consequences, the Commission weigh the potential efficiency gains associated with the agreement. In such cases, a balancing test is conducted in two steps.

1. The first step in assessing the potential anti-competitive effects of LTC involves a detailed examination of both market conditions and contractual settings. The European Commission assesses a range of factors, including the characteristics of the contract, the competitive strengths of the parties involved, the portion of demand each party contracts, the contract's duration, and the total market share secured by the agreement. These elements can collectively lead to anti-competitive effects if not properly scrutinized.

A key area of focus is the competitive position of both parties, particularly when one or more hold significant market power, or when a large share of demand is already controlled by a network of similar long-term agreements (Roques and Duquesne, 2024). In cases where the dominant supplier holds a substantial market share, its extensive coverage can contribute to market foreclosure and prevent consumers from switching to more competitive suppliers, further distorting market dynamics (see Section II) (De Hauteclocque, 2009). This comprehensive evaluation ensures that LTC are critically assessed for their potential to harm market competition, particularly in terms of limiting consumer choice and discouraging market entry by more efficient suppliers.

2. However, if the EC concludes that a given LTC, or a portfolio of LTC, adversely affect market competition based on previously established criteria, this assessment does not result in the contract's automatic exclusion. Instead, the EC further investigate to determine whether the LTC provides pro-competitive benefits that may outweigh its anti-competitive effects. The LTC will only be approved if the efficiency gains, such as increased investment in energy infrastructure or reduced costs for consumers, are deemed to overbalance the risks of market foreclosure or diminished competition. Additionally, these efficiency gains must ensure a fair distribution of welfare to end consumers, without compromising competition related to the contracted demand (Roques and Duquesne, 2024).

Although the case-by-case approach remains a widely accepted method for evaluating long-term contracts, the European Commission's methodology has become increasingly transparent over time. Nonetheless, it continues to lack a standardized framework, relying extensively on the unique characteristics of each case. This flexibility enables the Commission to account for industry-specific dynamics, such as demand maturity, the potential for establishing new resale networks, buyer power, and the likelihood of new entrants on both the supply and demand sides. However, this approach also introduces the risk of path dependency in competition enforcement, potentially compromising the consistency of its application across different cases.

The Evolution of the European Commission's Approach to Long-Term Contracts

Following market liberalization, the Directorate-General for Competition (DG COMP), the European Commission's division responsible for enforcing competition law, played a pivotal role in restructuring regulatory practices within the energy sector. DG COMP's oversight, particularly in relation to LTC, was instrumental in aligning market behaviours with the principles of liberalization, promoting efficiency, and ensuring competitive equity (Glachant and Lévêque, 2009). This regulatory balancing act between fostering economic efficiency and addressing anti-competitive risks encapsulates the central antitrust challenge within energy markets (De Hauteclocque and Glachant, 2009).

A key development in addressing LTC-related issues was the 2007 Energy Sector Inquiry, which revealed that LTC were bolstering incumbents' market dominance and constraining liquidity within the wholesale market. The Inquiry determined that the efficiency gains from LTC were insufficient to offset their anti-competitive impacts, leading the Commission to emphasize the risk of market foreclosure over potential advantages (De Hauteclocque and Glachant, 2009). Historically, the electricity sector operated through vertically and horizontally integrated structures, benefiting from economies of scale and centralized planning. However, the liberalization process disrupted this model, pushing incumbents to rely on LTC to maintain stability within a less liquid market environment.

The EC established that LTC were no longer essential to support new investments, particularly given the shift toward gas-fired generation with lower capital costs. LTC, especially for amortized assets or assets with minimal financing risks, were thus viewed negatively within this restructured market context (European Commission, 2007a; 2007b). The liberalized market framework increasingly encouraged suppliers and retailers to acquire customers through competitive pricing and favourable terms rather than through long-term contractual arrangements.

Despite the Commission's commitment to maintaining long-term generation adequacy, the concept of security of supply remains a contentious factor in antitrust cases. Political considerations have influenced the regulation of long-term gas import contracts, allowing for extended contract durations to accommodate geopolitical pressures, as seen in Recital 25 of the second Gas Directive (2003/55/EC). This balancing of political and market imperatives has led the Commission to design tailored remedies within the energy sector, including the application of Article 102 EC to address incumbents' LTC portfolios and expedite the formation of competitive market structures.

Today's electricity market has evolved considerably, with a diverse array of participants operating across multiple levels and timeframes. Notable structural changes, such as the unbundling of Transmission System Operators (TSOs) and Distribution System Operators (DSOs), have facilitated third-party access while curbing incumbent producers' control over transmission networks. The implementation of market coupling by TSOs has further optimized transmission capacity allocation, advancing regional price convergence and limiting incumbents' influence over customer access. Additionally, the 2007 Energy Sector Inquiry triggered the expansion of spot market trading, where new entrants benefit from increased liquidity, transparency, standardized pricing, and secure transactional mechanisms (European University Institute, 2024b).

In summary, these regulatory reforms have contributed to a more competitive and resilient electricity market, enabling the integration of renewable energy sources, and maximizing the use of interconnectors. However, the methodology used is not unique to energy markets, and the threshold-based mechanisms previously applied to other sectors may not be optimal for the unique challenges of the energy sector. The Commission's reliance on antitrust measures to shape market structures rather than market design poses a potential risk. This approach is based on limited understanding of the competition dynamics within the energy sector, making it difficult to propose robust and efficient remedies. Importantly, the process of market-building through antitrust measures is not confined to ex post regulation; it is a continuous "trial-and-error" process. Over time, the gradual clarification of rules enhances the credibility of self-enforcing competitive behaviours, contributing to the broader goals of market liberalization and security of supply.

Section IV : The Re-Emergence of Long-Term Contracts to Support the Energy Transition

In recent years, we have witnessed the emergence of a new market structure that is markedly different from the initial stages of energy industry liberalisation. Many energy markets have become more competitive, and long-term contracts are increasingly recognized as essential tools for coordinating and financing capital-intensive investments in clean technologies within the context of the energy transition. As this transition accelerates, the competitive advantages offered by LTC are expected to grow in significance, primarily due to their ability to improve efficiency. What has evolved since market liberalisation is not the nature of the challenges faced, but rather the emphasis placed on addressing these issues.

Section IV delves into the pro-competitive advantages of LTC in facilitating the deployment of renewable energies. It highlights how LTC help address critical market challenges that would otherwise be difficult to resolve, especially given the non-dispatchable nature of renewable energy technologies, their substantial capital costs, and the stochastic nature of their output due to cannibalisation and intermittency. LTC play a central role in overcoming these barriers by enabling better coordination and investment certainty, which are key to supporting the energy transition process. This development has culminated in the introduction of a new market proposal, which came into force in July 2024, underscoring the significant financial, economic, and social improvements that LTC can provide.

Adapting to the Integration of Variable Renewable Energy Sources

The ongoing energy transition has redefined priorities, particularly regarding the pursuit of carbon neutrality. The EU has committed to achieving decarbonisation by 2050, a legally binding objective that forms the core of the European Green Deal, enforced by the European Climate Law. In addition to environmental targets, the geopolitical consequences of Russia's invasion of Ukraine have forced the EU to rethink its energy supply architecture fundamentally. On March 8, 2022, the EC unveiled its REPowerEU strategy through the communication "Joint European Action for more Affordable, Secure, and Sustainable Energy." This plan seeks to eliminate the EU's dependency on Russian fossil fuels by promoting clean technology deployment and diversifying energy supplies while ensuring security of supply (European Commission, 2022). As the sustainable market landscape evolves, the urgency of creating a favourable environment to meet the decarbonisation objectives has intensified. Consequently, public intervention has become essential in guiding the energy transition (Roques and Finon, 2017). This shift requires addressing the complexities associated with the high penetration of Variable Renewable Energy (VRE) in the financial investment process. As renewable energies continue to grow, security of electricity supply has become a pressing concern, raising questions about system reliability. The increasing integration of VRE calls for urgent solutions to manage the associated supply variability (Peluchon, 2021). In traditional market designs, gas and coal-fired plants typically bid at marginal costs to cover fuel and operating expenses. These plants rely on scarcity periods and price spikes to recover their relatively low capital costs. However, the expansion of intermittent renewable energy sources, which have high fixed costs but nearly zero marginal costs, has led to a reduction in electricity generation prices. This price decline has also affected the profitability of conventional power plants, as VRE has lowered the load factors of thermal generation capacities, which depend on recovering capital costs over limited operational hours. This dynamic has further contributed to the decline in electricity prices (Bublitz et al., 2019).

One of the primary challenges facing capital-intensive investments in the energy sector is their susceptibility to non-hedgeable risks. The time required to recover financing costs often exceeds lenders' willingness to provide fundings without strong guarantees. In the absence of appropriate de-risking mechanisms, both financing and generation costs increase, exacerbating the already volatile nature of energy markets. As the sector transitions toward high fixed-cost technologies, the pathway to deep decarbonisation introduces additional obstacles, particularly within liberalised markets. Consequently, market prices and revenues are becoming increasingly volatile, complicating cost recovery efforts at a time when stability is essential. Attracting private investment in energy infrastructure hinges on the predictability of revenue streams, and LTC provide this by offering payments above market prices. This mechanism stabilizes revenues and expenses, making them more predictable for both parties.

As a result, both buyers and suppliers benefit from increased stability, reduced uncertainty, and lower capital costs for investments. Lenders and equity investors perceive projects with secured revenue streams as less risky because the risks associated with price fluctuations are distributed among market participants. For electricity markets to function efficiently, risks must be allocated in a manner that ensures renewable energy producers are only exposed to hedgeable risks, those risks that can be effectively managed and mitigated by investors, developers, and operators.

Price Risk

Price risk refers to the possibility that actual market price trends may fall below forecasted expectations, resulting in lower revenue generation. While short-term price fluctuations can be mitigated, it is the long-term market price risks that pose a significant challenge for investors, as future price trajectories depend on multiple factors. These factors include the share and composition of renewable energy in the grid, the expansion of flexibility mechanisms, and the availability of residual load capacities, besides the intermittency issue due to the stochastic nature of variable renewables. LTC typically mitigate price risks by providing a stable revenue stream to producers through the guarantee of a fixed strike price, whose stability allows for revenue predictability (European University Institute, 2024a).

Volume Risk

The generation of electricity from renewable sources like wind and solar is highly dependent on site-specific weather conditions, which can only be forecasted with limited accuracy, leading to deviations from expected outputs. Volume risks can also stem from temporary oversupply in renewable

electricity markets which can result in negative prices. In such cases, operators may be unable to sell their electricity unless inefficient support schemes incentivize trading during periods of negative pricing. Additionally, volume risk affects flexibility providers such as conventional thermal capacities, which feature very low fixed costs and high variable costs making vulnerable providers at the margin (European University Institute, 2024a).

Why not All Long-Term Contracts Offer Effective Hedging Opportunities

While the urgency of supporting renewable energy projects through long-term financial investments is critical for achieving carbon neutrality, not all long-term contracts follow the same trajectory. As discussed earlier, electricity markets are subject to increasing price volatility. This is driven by several factors: first, the need to balance supply and demand precisely to maintain grid stability contributes to market fluctuations; second, storage options remain structurally expensive and limited compared to the overall market volume; third, the majority of costs for renewable energy projects are incurred upfront during the project's initial phase, while operational expenses remain relatively low throughout the project's lifecycle. As a result, estimating a project's long-term profitability necessitates a comprehensive perspective on prices and revenues, which is particularly challenging due to the high volatility of electricity prices. In this unpredictable context, generators seek insurance against long-term uncertainties. Given the limited availability of long-term hedging options in electricity markets, state interventions providing revenue stabilization over extended periods may be necessary to finance renewable energy projects.

Contracts for Difference (CFD) offer a clear long-term forecast of potential revenues per kWh by fixing electricity delivery prices in the future. Another key support mechanism is fixed-price Power Purchase Agreement (PPA), which have seen significant growth in Europe. Contract volumes in the PPA market have steadily increased, reflecting a greater demand for price hedging tools. However, this raises a critical question: if the market already offers such mechanisms, why is government intervention necessary to ensure long-term price stability?

While instruments such as PPA and CFD can provide protection against price volatility, their availability remains limited relative to the scale required for the large-scale expansion of low carbon, in particular, renewable energy. The liquidity of PPA tend to decline as the duration of the contracts increases, which poses a significant challenge since renewable energy projects often require 15 to 20 years to achieve financial breakeven (European University Institute, 2024a). Consequently, although market-based mechanisms offer some degree of risk management, they are insufficient on their own to address the long-term financial requirements of these projects. This limitation underscores the essential role of state-backed mechanisms in ensuring the long-term financial viability of renewable energy investments.

One of the most critical challenges facing low carbon energy projects, particularly those involving variable renewables, is a phenomenon at the core of the ongoing debate about their integration into the energy mix: the higher the penetration of renewables, the more prices tend to decline, leading to more frequent price volatility. This dynamic, often referred to as price cannibalisation, occurs because as renewable capacity is deployed at high levels, it generates decreasing market returns, falling below average prices, due to the correlated nature of its generation. In practical terms, as more renewable energy sources with near-zero marginal costs feed into the grid simultaneously, market prices are further suppressed, reducing the revenues available to renewable producers.

The rapid expansion of renewable capacity in Europe exemplifies this challenge. Over the past five years, solar farm capacity in Europe has more than doubled, increasing from 127 GW to 301 GW, while wind capacity has risen from 188 GW to 279 GW. This substantial growth has significantly reduced the continent's dependence on fossil fuels and lowered carbon emissions. Indeed, for the first time, wind and solar power generation in Europe surpassed fossil fuel output in the first half of 2024. In 2024, European power prices dropped below zero for a record number of hours as the rapid expansion of solar and wind energy outpaced the continent's capacity to manage the surplus supply. Electricity prices reached negative levels for a total of 7,841 hours during the first eight months of 2024, with prices occasionally falling below minus €20 per megawatt-hour. This phenomenon underscores a significant concern raised by Mario Draghi, former European Central Bank Governor, in his September 9 report on the EU's competitiveness. Indeed, price cannibalisation could «discourage investments» and ultimately slow down the energy transition by undermining the economic viability of renewable energy projects. The report emphasised the importance of pairing the growth of renewable energy with sufficient investments in grids, flexibility, and storage to ensure a smooth transition (Tani and Millard, 2024).

The issue of price cannibalisation creates significant challenges for traditional PPA, which may become less attractive to buyers as these contracts are typically indexed to market prices. If market prices consistently fall below the thresholds required for a renewable energy project to achieve commercial viability, market players will be unwilling to enter into such contracts. This dynamic can be considered a form of market failure, necessitating government intervention. One viable solution to this problem is the introduction of CFD. When price cannibalisation drives market prices downward, or even into negative territory, governments or CFD providers are required to cover the difference between the market price and the strike price agreed upon in the CFD. Unlike PPA, which are contractual agreements between private entities, CFD are structured as a relationship between the state (or a designated implementation body) and the producer. This model addresses the significant gap in the market for long-term hedging instruments and protects against long-term uncertainty. By ensuring stable and predictable revenue streams for renewable energy producers, CFD mitigate the risks associated with volatile market conditions, while representing a critical policy tool in addressing both the limitations of PPA and the broader challenges posed by price cannibalisation in liberalised electricity markets.

While CFD are effective in providing price stability for renewable energy projects, they come with the challenge of increased subsidy costs, potentially exerting more pressure on state budgets or passing the burden onto consumers who fund these programs. The CFD mechanism features an implicit subsidy, as the strike price is typically set above the average market price to provide a stable revenue stream for renewable energy producers.

Feed-in Tariffs (FIT) represent another key mechanism for delivering subsidies, a policy mechanism that guarantees renewable energy producers a fixed payment per unit of electricity they generate and supply to the grid. This tariff is generally set higher than the prevailing market price, ensuring stable and predictable income for producers. The main difference between CFD and FIT lies in their payment structures: under CFD, producers receive the difference between the market price and a pre-agreed strike price. By contrast, under FIT, producers are paid a fixed price for all electricity generated, regardless of market fluctuations. Both CFD and FIT stand out as superior mechanisms compared to PPA, as they provide a robust hedge over a long-time horizon. FIT, in particular, are highly effective in promoting new or early-stage technologies, especially in markets lacking well-established market mechanisms or where centralized power management is dominant.

However, the very simplicity of FIT can lead to challenges, such as the inability to anticipate cost reductions, potentially resulting in overcompensation for developers. Moreover, it is difficult for governments to predict the number of qualifying projects, which can lead to market distortions, budget overruns, and potential legal disputes (Maynard and Ason, 2018). The European Commission's Directorate-General for Competition (DG COMP) has scrutinized the implicit subsidy elements in mechanisms such as CFD and FIT for years. DG COMP has been tasked with ensuring that state aid does not unduly distort competition, in line with Articles 107 and 108 of the Treaty on the Functioning of the European Union (TFEU). The concern is that subsidies offering guaranteed prices or fixed returns, particularly when set above average market prices, may provide an unfair advantage to renewable energy producers. This advantage, if not correctly supervised, could distort market competition and introduce inefficiencies by giving preferential treatment to those receiving subsidies, at the expense of competitors who do not receive similar support.

The adoption of the European Green Deal in 2019 marked a pivotal moment in the EU's commitment to achieving carbon neutrality by 2050. Building on this, the 2022 revision of the Energy and Environmental Aid Guidelines (EEAG), first introduced in 2014, further tightened the regulatory framework governing state aid to ensure that public funds support only necessary investments while minimizing potential market distortions. These revisions align with the broader objective of promoting the energy transition in a manner that maintains fair competition within the EU's Single Market. In addition to the EEAG, the Foreign Subsidies Regulation (FSR), which came into effect in 2023, addresses the EU's growing concerns about the distortive effects of subsidies, not only from EU Member States but also from non-EU countries and its adoption underscores the Commission's broader commitment to ensuring that foreign subsidies do not undermine the competitive landscape in Europe. (European Commission, 2023b).

The European Commission's Recent New Focus on Long-Term Contracts

The European Commission is committed to delivering the most efficient solutions to guarantee secure, sustainable, and affordable energy for all EU citizens. The energy crisis that unfolded throughout 2021 and 2022, characterized by significant price increases, triggered a series of emergency measures at both European and national levels. While these short-term interventions were effective in mitigating the immediate impact of rising energy prices, the crisis revealed several structural weaknesses in the existing market landscape. Notably, the vulnerability of consumers and industries to sudden price spikes underscored the EU's dependency on imported fossil fuels and highlighted the inflexibility of the electricity system's non-fossil fuel sources.

One of the most pressing challenges emerging from the crisis is the substantial investment required to support the large-scale deployment of renewable energy infrastructure. This includes not only investments in generation capacity, but also in grid modernization, energy storage solutions, and the digital technologies necessary to manage the inherent variability of renewable energy sources. The evolving relationship between public and private investments has driven the creation of new policy frameworks, with a central focus on redefining the role of long-term contracts.

In response to these challenges, the EC introduced comprehensive reforms to the existing electricity market rules in March 2023 as part of the Green Deal Industrial Plan. This reform is codified in the Amending Directive EU/2024/1711 and the Amending Regulation EU/2024/1747, both of which came into force on 16 July 2024. These regulatory changes aim to create a more resilient, flexible, and integrated energy system, capable of addressing both current challenges and future demands in a way that supports the EU's ambitious decarbonisation goals. The proposal introduces significant revisions to several key pieces of EU legislation pertaining to the regulation of the internal electricity market regulation, the two Electricity Directives[1] , and the REMIT[2] Regulation.

1 The Directives on common rules for the internal market for electricity (EU/2019/944) and the Regulation on the internal market for electricity (EU/2019/943) put the consumer at the centre of the clean energy transition, enabling active participation, with a strong framework for consumer protection. The rules allow more flexibility to accommodate the increasing share of renewable energy in the grid and contribute to the creation of green jobs and growth (European Commission, 2024, Electricity market design. Energy. Available at https://energy.ec.europa.eu/topics/markets-and-consumers/electricity-market-design_en).

2 The Wholesale Energy Market Integrity and Transparency (REMIT) Regulation (EU/1227/2011) was introduced to ensure transparency and integrity in the European wholesale energy markets. The regulation aims to detect and deter market manipulation and insider trading, ensuring that energy prices reflect a fair and competitive market rather than abuse by participants. (European Commission, 2024, Electricity market design. Energy. Available at https://energy.ec.europa.eu/topics/markets-and-consumers/electricity-market-design_en).

Amending Directive EU/2024/1711

Directive EU/2024/1711 constitutes a key piece of the reforms aiming at improving the European Union's electricity market design, particularly in response to the gas crisis and the Russian invasion of Ukraine, which exacerbated energy price volatility. This directive seeks to bolster the resilience of the electricity market by reducing dependency on fossil fuels, promoting renewable energy, and enhancing energy efficiency across Member States. A significant focus of the amendment is the «supply of last resort», a critical mechanism introduced to protect vulnerable consumers from the risks posed by price fluctuations and market failures. By ensuring a backup energy supply in cases of extreme price surges or supplier insolvency, this provision aligns with the EU's broader objectives of social equity and energy security. Importantly, this mechanism does not obligate Member States to enforce specific minimum prices unless the consumers in question meet eligibility criteria.

For non-household consumers, the directive acknowledges the importance of considering commercial and technical factors in determining whether the energy offers provided are market-based. This ensures that the energy market remains adaptable to different consumer groups while maintaining affordability for those most at risk, especially in cases of energy poverty. The directive also underscores the importance of long-term contracts, such as power purchase agreements, to provide price stability and shield consumers from short-term market fluctuations.

Another critical component of the directive is its emphasis on enhancing grid flexibility and expanding infrastructure to support the integration of a growing share of renewable energy. By promoting grid modernization, the directive seeks to enhance both security of supply and the ability to adapt to variable demand and generation patterns, inherent to renewable sources such as wind and solar.

To foster greater consumer participation in the electricity market, the directive encourages the adoption of demand response schemes. These schemes enable consumers to use technologies such as smart meters and other dedicated measurement solutions to optimize their energy consumption in response to price signals. For instance, flexible appliances, such as electric vehicles or heat pumps, can adjust their usage patterns automatically, thus contributing to grid stability. Furthermore, consumers benefit from energy-sharing agreements and multiple supply contracts, ensuring that the system remains adaptive and resilient.

This comprehensive approach highlights the European Union's commitment to creating a sustainable, secure, and competitive energy market that supports renewable energy integration, enhances consumer protection, and strengthens industrial competitiveness (European Parliament and Council of the European Union, 2024a, Directive EU/2024/1711).

Amending Regulation EU/2024/1747

Regulation EU/2024/1747 emphasises the critical role of long-term contracts in ensuring stability for renewable energy markets, particularly power purchase agreements. It leaves it to the discretion of individual Member States to foster conducive market environments for these contracts, especially as they aim to meet the decarbonisation goals set in their national energy and climate strategies. In crafting policies for a robust PPA market, Member States must not only consider the existing framework but also account for the potential impacts of new regulatory measures on both current and future agreements. To facilitate the uptake of PPA, governments must actively identify and remove regulatory and administrative barriers that hinder these agreements. In tandem, it is essential that mechanisms to mitigate the financial risks associated with buyer defaults, particularly in cases where private guarantees are insufficient, are made available. These guarantees should be structured to maintain liquidity within the market, ensuring stability and investor confidence. For smaller customers, Member States could also implement demand aggregation measures, allowing them to pool their demand to make PPA more attractive to producers.

These mechanisms should offer sufficient incentives to promote long-term stability for renewable energy projects without undermining competitive dynamics. Transparency and non-discrimination are essential principles in the design of these support schemes, ensuring that they foster a level playing field for all market participants. In instances where competitive bidding is not feasible, the setting of strike prices under CFD must be carefully managed to avoid market disruption. The goal is to uphold fair competition across the internal energy market, ensuring that all participants can compete under equitable conditions, thereby safeguarding the integrity of market mechanisms while promoting the expansion of clean energy.

While the focus remains on accelerating the deployment of renewable energy sources, nuclear power is also recognized as a key low-carbon alternative that can support decarbonisation efforts. In the context of nuclear energy, the emphasis has shifted away from traditional concerns of price and volume risk. Instead, the primary challenge lies in managing construction-related risks, given the long lead times and high capital costs associated with nuclear projects. Thus, nuclear energy, alongside renewable sources, is positioned as a strategic technology in the energy transition, offering a stable and low-carbon energy supply that complements intermittent renewable sources. (European Parliament and Council of the European Union, 2024b, Regulation EU/2024/1747).

The ongoing reforms redefine the essential role of LTC, establishing them as crucial instruments for achieving carbon neutrality. These reforms primarily aim to address the issue of electricity price volatility, which is closely tied to fossil fuel prices. By creating a buffer between short-term market fluctuations and consumer costs, LTC can stabilize electricity prices over the long term. However, while CFD can introduce subsidy elements that complicate market dynamics, the reforms strengthen the role of the Agency for the Cooperation of Energy Regulators (ACER) and national regulators. This enhancement ensures rigorous monitoring of the integrity and transparency of wholesale energy markets, fostering a competitive environment and ensuring that prices are set in a transparent, market-driven manner.

The increased support for renewable energy deployment is aimed at reducing the electricity system's dependence on fossil fuel generation, which is expected to lead to lower electricity prices. A central tenet of these policy proposals is the decoupling of consumer electricity bills from gas prices. Although the reforms do not directly alter the short-term formation of market prices, they reshape how infra-marginal generators are compensated. While generators will continue to participate in short-term markets, their revenues will no longer be dictated by the volatility of those prices. Instead, revenues will be increasingly determined by long-term contracts, depending on whether the generation assets are funded privately or publicly. Thus, the mechanism not only provides consumers with access to more affordable electricity but also ensures the financial stability and predictability necessary for expanding renewable and low-carbon energy sources. By reducing the influence of gas in setting power prices, the reforms aim to protect consumers from price volatility while empowering them with greater contract flexibility and direct access to renewable energy.

At the heart of the new design is consumer protection. The reforms introduce new rights, including the ability to choose fixed-price contracts, enter into multiple or tailored contracts, and access clearer pre-contractual information. These measures will enable consumers to secure long-term price stability, shield themselves from sudden price spikes, and guarantee continuous access to electricity, even in the event of supplier failure. Moreover, the right to energy sharing empowers consumers to take greater control of their energy use. They will have the option to sell or donate electricity to others, rent or lease off-site energy facilities, and participate in energy sharing within their communities.

Finally, the proposed revisions to the Regulation on Wholesale Energy Market Integrity and Transparency (REMIT) grant national and EU authorities enhanced powers to monitor market integrity, ensuring competitive behaviour and transparent pricing across energy markets Importantly, the European Union's ambitious decarbonisation goals are unlikely to be met if it maintains an outdated resistance to various forms of long-term contract arrangements with professional consumers. The modern energy market requires greater flexibility in LTC to drive the necessary investment in renewable infrastructure and industrial transformation (European University Institute, 2024b).

Conclusion

While the current European wholesale market design has a good record in efficiently organising dispatch, it has proven insufficient in delivering the necessary investment signals for low carbon generation technologies and ensuring stability and supply resilience. In this context, long-term contracts (LTC) are increasingly recognized as vital instruments for mitigating price volatility in electricity markets and securing the necessary levels of investment.

The challenge is double. First, LTC can reduce the intrinsic price volatility of markets for electricity, a non-storable good, where even small changes in demand, e.g., due to the weather, large, discontinuous changes in prices. Second, beyond this intrinsic volatility, European electricity markets have been plagued by a lack of a stable regulatory framework for LTC themselves, which further diminishes investor confidence and their willingness to bear the risks associated with investing in new generation capacity. Hancher et al. (2024) highlight that one of the principal contributors to the unpredictability of current electricity markets is precisely the inconsistent and incomplete guidance surrounding the use of LTC across various market segments. This lack of a clear and cohesive regulatory framework for LTC at the EU-level can lead to the application of outdated regulations or inconsistent interpretations of the rules governing contractual practices by national competition authorities.

Very recently, the European Union has provided a broad new general framework for the adoption of LTC. This is a very welcome development. However, for the time being this framework still lack more detailed guidance based on a coherent conceptual model to assess different types of LTC, the associated risk profiles of different technologies and their specific roles in integrated low carbon electricity markets. As a result, the European electricity market remains fragmented and lacks harmonisation across Member States. Each Member State tends to interpret and implement the current general framework according to its domestic policy priorities and local needs, often proposing ad hoc solutions with uncertain long-term effects.

This piecemeal approach not only exacerbates market fragmentation but also introduces inconsistencies, posing a risk of failing to provide adequate mechanisms for the hedging of long-term uncertainty. A more complete and systematic harmonised approach is thus necessary to ensure that LTC effectively address investment risks and support the long-term stability required for the decarbonisation of the energy sector. Future guidance from the European Commission must also address the legal standing of LTC and how the latter is shaped by the specific characteristics of contracts, market structure, and the nature of the parties involved.

While the Commission's recent market design regulations recognize the critical role of LTC in achieving decarbonisation objectives, the updated guidelines on vertical restraints and State aid lack sufficient detail on how competition assessments should be conducted. Central questions remain unresolved concerning the pro-competitive and anti-competitive effects of LTC, which will be essential for future evaluations and for the effective advancement of decarbonisation in the energy sector.

A more comprehensive analysis of the competitive impacts of LTC is thus still needed, presenting a challenge for competition authorities who must navigate established regulatory doctrines while adopting new tools to ensure effective market oversight. Although each contract must be evaluated on its individual merits, with consideration given to its specific benefits and risks, greater legal certainty and transparency are available for publicly backed agreements, which are generally assessed under State aid rules (European University Institute, 2024b).

Despite the availability of general principles from existing cases, these remain limited, necessitating that most LTC assessments be conducted on a case-by-case basis. This requires a delicate balancing of both pro- and anti-competitive

effects, which remain to be clearly defined (Roques and Duquesne, 2024). The overarching goal is thus to create a framework that allows LTC to support the European Union's ambitious energy transition targets by offering new and efficient risk hedging instruments to investors in low carbon generation while maintaining the competitive integrity of its electricity markets.

Bibliography

Allaz, B., and Vila, J. L. (1993). Cournot competition, forward markets and efficiency. Journal of Economic Theory 59(1), 1-16.

Bublitz, A., Keles, D., Zimmermann, F., Fraunholz, C., and Fichtner, W. (2019). "A survey on electricity market design: Insights from theory and real-world implementations of capacity remuneration mechanisms". Energy Economics 80, 1059-1078.

Consolidated version of the Treaty on the Functioning of the European Union (2008). "Article 101 (ex-Article 81 TEC)" in "Part Three: Union Policies and Internal Actions, Title VII: Common Rules on Competition, Taxation and Approximation of Laws, Chapter 1: Rules on competition- Section 1: Rules applying to undertakings,", Official Journal of the European Union 9 May 2008. Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A12008E101%3AEN%3AHTML.

Consolidated version of the Treaty on the Functioning of the European Union (2008). "Article 102 (ex-Article 82 TEC)" in "Part Three: Union Policies and Internal Actions, Title VII: Common Rules on Competition, Taxation and Approximation of Laws, Chapter 1: Rules on competition- Section 1: Rules applying to undertakings," Official Journal of the European Union 9 May 2008. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A12008E102.

De Hauteclocque, A. (2009). Legal Uncertainty and Competition Policy in European Deregulated Electricity Markets: The Case of Long–term Exclusive Supply Contracts. World Competition 32(1).

De Hauteclocque, A., and Glachant, J. M. (2009). "Long-term energy supply contracts in European competition policy: Fuzzy not crazy." Energy Policy 37(12), 5399-5407.

European Commission (2007a). Inquiry pursuant to Article 17 of Regulation (EC) No 1/2003 into the European gas and electricity sectors (Final Report), Commission staff working document accompanying the Communication from the Commission {COM(2006) 851 final}, 10 January 2007, Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52006SC1724.

European Commission DG Competition. (2007b). DG Competition Report on Energy Sector Inquiry, SEC (2006) 1724. Available at https://www.astrid-online.it/static/upload/protected/Tech/TechnicalReport_Energy_part1.pdf

European Commission (2014). Notice on agreements of minor importance which do not appreciably restrict competition under Article 101(1) of the Treaty on the Functioning of the European Union, Communication from the Commission, Official Journal of the European Union 30 August 2014. Available at https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52014XC0830%2801%29

European Commission (2022). Implementing the REPower EU Action Plan: Investment Needs, Hydrogen Accelerator and Achieving the Bio-Methane Targets. Commission Staff Working Document {COM(2022) 230 final}. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230andfrom=EN.

European Commission. (2023a). Questions and answers on the revision of the EU's internal electricity market design. Strasbourg, 14 March 2023. Available at https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_1593

European Commission. (2023b). Foreign subsidies regulation. Competition Policy. Available at https://competition-policy.ec.europa.eu/foreign-subsidies-regulation_en

European Parliament and Council of the European Union. (2024a). Directive (EU) 2024/1711 of the European Parliament and of the Council of 13 June 2024 on improving consumer rights in cross-border trade. Official Journal of the European Union 26 June 2024. Available at https://eur-lex.europa.eu/eli/dir/2024/1711.

European Parliament and Council of the European Union. (2024b). Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design. Official Journal of the European Union 26 June 2024. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1747.

Glachant, J. M., and Lévêque, F. (2009). The electricity internal market in the European Union: What to do next? In Electricity Reform in Europe. Edward Elgar Publishing.

Hancher, L., Dezobry, G., Glachant, J. M., and Menegatti, E. (2024b). "Leveraging the Energy Transition: the role of long-term contracts". European University Institute. Available at https://cadmus.eui.eu/bitstream/handle/1814/76880/RSC_TR_2024_05.pdf?sequence=1andisAllowed=y

Keppler, J. H., Quemin, S., and Saguan, M. (2022). Why the sustainable provision of low-carbon electricity needs hybrid markets. Energy Policy 171, p. 1-12.

Kitzing, L. H., Held, A., Gephart, M., Wagner, F., Anatolitis, V., and Klessmann, C. (2024a). "Contracts-for-Difference to support renewable energy technologies: Considerations for design and implementation". European University Institute. Available at https://cadmus.eui.eu/bitstream/handle/1814/76700/RSC_TR_2024_03.pdf?sequence=1andisAllowed=y

Maynard, S., and Ason, A. (2018). Sovereign risk in international renewable energy investments: Key lessons from oil and gas disputes. Euromoney's Expert Guide – Rising Stars 2018, International Arbitration, UK.

Peluchon, B. (2021). "Decarbonizing the Electricity Sector Efficiently Requires a Change of Market Design". CEEM Working Paper 51. Dauphine University, Paris.

Roques, F. A., Newbery, D. M., and Nuttall, W. J. (2008). "Fuel mix diversification incentives in liberalised electricity markets: A Mean–Variance Portfolio theory approach". Energy Economics 30(4), 1831-1849.

Roques, F., and Duquesne, G. (2024). "The return of long-term contracts in electricity markets: Implications for competition policy". CEEM Policy Paper, No. 3, June 2024. Available at https://ceem-dauphine.org/wp-content/uploads/2024/06/PP3-1.pdf.

Roques, F., and Finon, D. (2017). "Adapting electricity markets to decarbonisation and security of supply objectives: Toward a hybrid regime?", Energy Policy 105, 584-596.

Tani, S., and Millard, R. (2024). "Negative European energy prices hit record level". Financial Times, 14 September 2024. Available at https://www.ft.com/content/1f94d0b4-c839-40a2-9c8d-782c00384154.