AFTER THE COVID CRSIS, IS THE EUROPEAN ELECTRICITY MARKET DESIGN READY FOR THE ENERGY TRANSITION?

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Overview

Since Summer 2021, electricity prices in Europe have been on the rise and have experienced extraordinary levels of volatility, sometimes moving from negative values to hundreds of euros per MWh in a matter of hours. Price differentials between neighbouring market zones have also been occasionally very large – even in the order of hundreds of euros – signalling the existence of significant bottlenecks in the European transmission grid. This situation has led to the bankruptcy of several energy retailers, significant losses for unbalanced generators, equally significant windfall profits for others, and numerous disruptions to energy-intensive production processes in the manufacturing sector. Calls for short-term measures relieving consumers' pain, especially households and small businesses, have been widespread. Governments in countries like France and Italy have answered positively, allocating billions of euros to reduce energy bills. Eventually, the price crisis has re-opened the discussion about the suitability of the European electricity market design that has emerged over the past two decades, with various stakeholders and even a few national governments calling for its reform.

There is increasing evidence that an electricity system dominated by variable renewable energy sources (vRES) such as wind and solar photovoltaic is characterised by significant price volatility (Joskow, 2019; Mallapragada et al., 2021; Lebeau et al., 2021) and that traditional business models mostly built around short and medium-term wholesale markets are not necessarily adequate to deal with the cost structure of renewables and the increased levels of risk and uncertainty (Joskow, 2021; Roques, 2021). Therefore, what the European Union (EU) has been experiencing in the second half of 2021, primarily due to a significant increase in the price of natural gas, looks like an anticipation of what it will experience in less than ten years, if it has to achieve the energy and climate targets to which it recently committed (European Parliament and Council, 2021). Indeed, in order to achieve a reduction of 55% of its greenhouse gas emissions by 2030, the EU is betting heavily on the massive penetration of renewables in the electricity generation mix (up to 70-80%) and on the electrification of end uses, notably transport and heating in buildings (European Commission, 2020).

Methods

The paper aims to explore the strand of reforms that the EU may be required to implement in the coming years to have in place an institutional setting for electricity consistent with its decarbonisation policy.

The analysis starts with the acknowledgement that energy-only wholesale markets are likely to be insufficient to attract adequate investments in an electricity system that must increasingly rely on vRES. This type of markets is not capable of providing efficient signals regarding investment decisions in long-lived and capital-intensive generation assets, such as wind farms and PV plants, while is it much better at stimulating an efficient use of existing assets (operational decisions). In order to provide sufficient incentives for investments, energy-only markets must deliver very high prices in a sufficient number of hours each year, but recent experience shows that societies are not ready to accept such huge volatility in prices, nor are risk-averse energy companies. Carbon prices and new storage technologies will bring changes but will not significantly alter this result. Hence, long-term contracts will be needed to secure the necessary revenue streams to attract investors in new capacity. At the moment, however, long-term contracts are not widely and consistently used in European electricity markets, except for the public support of new, large-scale RES power plants.

The analysis then goes beyond the electricity market design as defined in narrow terms and looks at the broader institutional framework, because long-term contracts are only one of the elements that characterise an electricity system capable of dealing with high shares of vRES (Glachant et al., 2017; Joskow, 2021). At least two other elements are equally important and must be assessed in the European context. They are electricity networks planning and resource adequacy assessment. An efficient use of system resources requires a grid connecting generation, storage and consumption assets over large areas. This is particularly relevant for a system that is mainly based on the exploitation of vRES, notably wind, which might not be evenly distributed across countries and regions. Recently observed spreads in electricity spot prices suggest that the European grid cannot be considered a copper plate, and a strengthening of the network expansion process and its coordination at the supra-national level are needed to contain

the costs of the electricity system that will be in place in 2030. A careful assessment of resource adequacy is necessary to ensure that the system can cope under any foreseeable circumstance and preserve the continuity of supply. Again, for a system mostly based on vRES the performance of a careful resource adequacy assessment is critical, given the reduced level of dispatchable generation assets present in the system. The alerts issued in the past few months regarding the possibility of load-shedding and brownouts in France, eventually avoided due to mild weather conditions, and the rejection of the European Resource Adequacy Assessment by the Agency for the Cooperation of Energy Regulators highlight the difficulty of assessing resource adequacy and the need to further develop a consistent approach at European level.

Results

The paper shows that the existing institutional setting in the EU is not fit for supporting the deep decarbonisation of the electricity system over the next decade. This is the case for three reasons. First, the current focus on energy-only wholesale electricity markets does not ensure a stable and adequate stream of revenues for investors in new generation capacity. Despite the current high prices observed in electricity markets, a new wave of investment in RES might fail to materialise due to the considerable uncertainty over future spot prices. Second, the existing European transmission grid is still characterised by significant bottlenecks that can lead to market splitting in many hours of the year. More coordinated and faster planning and expansion of the European transmission grid is needed to fully exploit the locations with abundant renewable endowments and take advantage of the lack of perfect correlation between renewables' availability in distant locations. Third, the assessment of system adequacy must be improved to ensure that possible gaps between supply and demand of electricity are duly anticipated by system operators and the necessary corrective measures put in place. Given the interconnectedness of national electricity systems in Europe, such assessment must be performed at the European level, taking into account all the system resources available both on the supply and demand side in a neutral way.

Conclusions

The proper design of electricity markets is one of the critical issues that must be considered when adapting the institutional setting of the EU to the challenges posed by the rapid energy transition to which it committed in 2021. However, the role of spot markets and long-term contracts is only one of the pieces of the puzzle. Effective planning and expansion of electricity grids and a consistent resource adequacy assessment at the supra-local level are equally important. Failing to address all of them may easily lead to a derailment of decarbonisation policies in the EU and other large jurisdictions worldwide. In the US, for example, grid planning mainly occurs at the state or sub-state level, hampering the development of a national "super-grid". Similar problems may also emerge in China, where both the central state and the provinces have a say in the governance of the electricity system.

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