Popular science summary

Since the 1990s, the European Union has introduced a series of legal norms to unify and liberalize the internal energy market. The tool for achieving this goal are the four energy packages of 1996, 2003, 2009, and 2019. The construction of a common European electricity market is intended, i.e., to ensure energy security (as in the case of the failure of the Polish power plant in Bełchatów (17 May 2021), where 10 out of 11 power units were switched off, and energy was imported to Poland mainly from Germany and Sweden to avoid a blackout), increase electricity affordability, facilitate the integration of renewable energy sources (RES), improving competitiveness and combating climate change.

Unfortunately, despite many measures taken by the European Union to develop the European energy market, the current structure and regulatory framework give rise to numerous problems at the interface between technology, institutional conditions, and market organization. Many Member States are adapting their legislation in a limited way and are concentrating exclusively on national interests.

In the context of a discussion on the integration of the European electricity market, important questions should be posed. First, does the European Union energy policy affect the degree of integration of the energy sector? Second, is there integration between geographically closer markets much higher? Thirdly, how does price volatility spillover affect the degree of interconnection of electricity markets?

The above questions simultaneously formulate three main objectives of this research project. First, the assessment of the impact of the EU energy policy on the degree of European electricity market integration. Second, the identification of electricity markets that are regionally integrated. Third, assessment of the impact of volatility spillover on the connectedness among European electricity markets.

The project will cover a large sample of European electricity markets limited only by data availability. The project will consist of two main stages. In the first part of the project, we intend to investigate the degree of European electricity market integration, considering not only Central Western Europe (CWE) markets, which have been extensively analyzed in literature but also those of Central and Eastern European (CEE). The impact of the Energy Union energy policy on the degree of European electricity market integration will be indicated. For this purpose, two approaches available in the literature will be used, modified to obtain as faithful a picture as possible of the process under examination. This part of the project should produce results that will also be relevant to the discussion on Poland's energy policy. The second part of the project will investigate the spillover of price volatility to assess whether geographically connected electricity markets are characterized by higher transmission volatility. The role of individual markets (identifying the receivers and transmitters of volatility) will also be indicated using advanced linkage models.

This project has several dimensions that can be described as innovative. First, our project is a voice in the ongoing debate in the literature devoted to the degree of integration of European electricity markets. To the best of our knowledge, although this ongoing debate on the degree of integration of European electricity markets, the number of studies focusing on CEE countries is still scarce. Therefore, this project will contribute to the discussion on the integration of CWE markets and CEE, including Poland's energy policy. In total, the study will cover about twenty countries. Second, EU policy on energy market integration is changing. At the beginning of 2019, the legal acts of the fourth energy package (so-called "*Winter Package*") were finalized, which included new electricity market rules to meet renewable energy needs and attract investment. However, many studies miss the lessons of the Fourth Energy Package as they only focus on the 1996, 2003, and 2009 packages. To fill this gap, we will assess the impact of recent EU policies on the degree of integration of energy markets. Furthermore, we are interested in the conduct of electricity markets during COVID-19. Another novelty is related to the application of modern statistical and econometric methods, which are expected to enable a better understanding of the phenomena studied. We believe that the results of the project will contribute to further research on energy security and sustainable development. In addition, the results of the project may be of interest to policymakers influencing energy policy as well as industry and consumers, since the integration of energy markets brings many economic, social, and environmental benefits (e.g., it affects lower electricity prices and energy security).