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Editorial

Special issue on European Union: Markets and regulators editorial

The European Union has taken a leading role in the process of transformation of the energy sector for the transition to a low carbon economy. This has created several opportunities and challenges for policymakers and businesses operating in the energy sector as new directives and regulations are developed and implemented. To improve our understanding on the nature of these emerging challenges a workshop was organised in Barcelona on February 3rd 2015, which saw the participation of eminent energy researchers from across the European academia. This introduction to the special issues provides some reflection about the challenging issues being tackled by the European Commission and individual Members States. The second section summarises the articles from the workshop, which make up this special issue and which provide insightful evidence, commentary and policy recommendations for a successful and efficient transformation to a low carbon European energy system.

1. Emerging challenges for business and regulators in European energy markets

Recent developments in global energy markets have generated opportunities and challenges for businesses and policymakers due to the rapid increase in energy demand from emerging and developing countries, geopolitical instability in different parts of the world, and most importantly the growing concerns about the impact of climate change on the quality of human and natural life, leading several countries to engage in decarbonisation policies and actions. The policy makers in the European Union have attempted to tackle such challenges over time through a series of legislative and regulatory interventions in the areas of climate and energy policy.

While the development of the European economic integration has had energy policy as one of its main pillars since its inception in the 1950s, starting from the 1990s energy markets in Europe have been shaped by both national and supra-national (EU) policies simultaneously pursuing the objective of creating an internal energy market subject to competitive forces but with limited coordination across Member States. This has led to the creation of energy only markets with different characteristics and regulatory frameworks across Europe (Marty, 2016). The European Union has for many years played a leading role in the process of liberalisation of the energy sector through a series of legislative and regulatory interventions aimed at promoting the creation of an internal energy market through a process of privatisation, liberalisation and integration across national energy markets.

In recent years however, the additional policy objectives of decarbonisation and security of supply have dramatically transformed the energy sector across Europe leading to increased penetration of renewable technologies; a transformation that has created challenges for the different European energy systems, characterised by the presence of energy only markets, as a result of deregulation policies promote by successive EU energy directives. The creation of energy-only markets in Europe can be ascribed at least in part to a general mistrust of long term contracts, due to the potential risk of abuse of market power and market foreclosure which have been associated with them in the academic literature and in the practice of competition policy (see De Hautecloque (2009) and Motta (2004)). However the recent radical transformations of the European energy system have led to questions about the suitability of energy-only markets to provide reliable and affordable energy in the presence of increasing penetration of generation from intermittent and renewable sources (Henriot et al., 2013). As a result of this transformation the provision of balancing and flexibility services has become increasingly important with significant economic effects on final consumers' energy bills (e.g. see Huber et al. (2014)). Furthermore the introduction of carbon prices has altered the fuel mix for electricity generation, indirectly affecting the gas prices observed in European markets, as discussed in some of the contributions to the special issue summarised below.

The pursuit of decarbonisation objectives and the ensuing increased penetration of generation from renewable sources have had important consequences also in terms of the need to extend, reinforce and further integrate the European electricity networks in order to address the increasing needs for flexibility and reserve services. Furthermore, the pursuit of policy objectives of security of supply has become more prevalent in the gas industry in recent years (e.g. see Westphal (2014)). The recent investment in the European gas networks and transportation systems has been dictated by the need to address security of supply problems in gas markets as a precautionary measure against re-emerging geopolitical instability and changes in the trade flows following the Fukushima accident and the boom of shale gas production in the US.

As a consequence of the repositioning of European energy policy which has moved beyond the objectives of liberalisation and market integration towards an extended list of objective, including security of supply and decarbonisation, the implementation of energy policy measures by regulators and businesses has become more complex and challenging, and has led to potential conflicts between objectives, with costly consequences for energy users and taxpayers. The cost effectiveness of decarbonisation and energy policy measures is becoming an increasingly important criterion of policy evaluation as the affordability of energy bills is a

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prominent thought in the European taxpayers' and voters' minds, while fuel poverty is becoming a growing social concern. However the implementation of energy and climate policies has not always been pursued in a cost effective manner, in part as a result of a lack of coordination across different the Member States or due to different authorities devising and implementing policy measures in different climate and energy related sectors.

The workshop on Energy Markets and Sustainability was organised at University of Barcelona with the aim of investigating the challenges facing European countries in their attempts to develop policies which promote the development of efficient, resilient and sustainable energy markets.

2. Overview of the contributions to the special issue

The papers in this special issue discuss the complex interaction between industry, markets, regulators and policy makers who are involved in enacting the transition to low carbon energy systems. The electricity sector in particular is facing considerable challenges as the industry where the most intense activity is taking place, with the aim of addressing decarbonisation objectives. This has resulted in sustained technological change and policy interventions in the form of market reform and Government support to emerging renewable technologies.

2.1. Missing markets

Newbery (2016) discusses the role of missing money and missing market problems in relation to the reliability and adequacy issues currently faced in the European energy-only markets. The paper argues that the biases towards over-procurement of capacity in existing capacity mechanisms can exacerbate the missing money problems associated with energy-only markets, partly as a result of ignoring missing market problems, such as the lack of relatively long term future markets. More specifically the paper assesses the outcome of the first capacity auction in the UK and its ability to address the market failures associated with energy-only markets which are becoming prevalent in Europe following the implementation of the Third Energy package.

The author also discusses the relationship between capacity mechanisms and cross-border trading, reaching the conclusion that in order to address the reliability problems associated with the increased penetration of generation from renewable sources, the EU Target Electricity Market (TEM) should be operate on the basis of true scarcity prices, but also rely on bilateral agreements between system operators regarding the actions to be taken at stress events. The market design of the European TEM was based on the set up of the Scandinavian energy-only market Nord Pool, which has not experienced capacity adequacy issues despite the fact that it does not rely on capacity payment mechanisms. In line with this assessment of the main features of European electricity market, the author therefore argues that, in the presence of reliable price signals guiding cross-border trading and in the absence direct policy interventions, the implementation of a common capacity market would not be required in order to deal with reliability issues at the European level, so that different Member States would be able to independently develop their own capacity market design, on the basis of the experience of recently developed capacity markets.

2.2. Empirical assessment of market liberalisation and RES integration

The next three contributions rely on recent empirical evidence and data analysis to assess the impacts of energy market liberalisation and integration of high levels of generation from intermittent renewable sources in electricity systems. Two of these contributions provide estimates of the costs associated with such integration while the third one assesses the balancing costs associated with the introduction of retail market competition.

The role of balancing markets has become increasing critical for the reliability of power systems characterised by high levels of penetration of generation from renewable sources. The contribution Batalla-Bejerano and Trujillo-Baute (2016) attempts to assess the contrasting effects of the increased penetration of renewables on retail electricity pricing. While the cost of subsidizing renewable technologies is reflected directly in final energy bills the low marginal cost of energy from this sources has led to a reduction in wholesale prices. At the same time the volatility and intermittency of supply form renewable sources has caused an increase in the cost of ancillary and balancing services which has contributed to increasing energy bills for final consumers. The authors of this paper contribute to the debate about the implications of increasing renewable penetration by providing empirical evidence about the effect of renewables integration on balancing requirements and costs in the Spanish electricity market. The Spanish case is particularly significant as Spain has levels of installed capacity of renewable energy among the highest in Europe and one of the highest levels of penetration of wind and solar percentage of total energy supply from renewables in the European Union. Furthermore Spain is characteristic by a relatively interconnection with neighbouring countries, which makes the challenges of ensuring a reliable and adequate electricity supply more difficult to meet in the presence of high levels of variable generation from renewable sources. However the authors also point out the effect of increased renewable energy penetration depends on the state of the system so that it would be difficult generalise their impact on the demand for ancillary services across different timescales and systems. The empirical analysis of the recent changes in balancing costs in the Spanish electricity markets leads the authors to conclude that both uncertainty and variability in supply have a positive effect on adjustment costs. They also argue that the availability of flexible plant is more critical in countries with limited interconnection such as Spain in order to limit the adjustment costs associated with intermittent generation.

Recent changes in balancing requirements which have emerged as a result of regulatory interventions in Spain are also the focus of the contribution by Batalla-Bejerano et al. (2016), who investigate the impact of the retail market liberalisation in 2009 on the costs of Spanish electricity system and, as a consequence, on final consumers prices. The authors argue that the transposition of the second EU energy directive into national regulation with the objective of promoting competition in the retail market had generated unexpected effects in other parts of the Spanish energy system, causing an increase in balancing costs. By analysing the cost of volume adjustments before and after the 2009 market reform the authors are able to estimate the impact on final consumer bills of the additional costs associated with the balancing requirement induced by deviations of demand from predicted volumes. The authors identify significant changes in the balancing requirements of the Spanish energy system as a result of the transition to a competitive retail market due to the change in the role of the local distribution system operators. The new balancing requirements have arisen from the limited ability of energy suppliers to produce reliable estimates for final demand on the basis of a limited amount of metered data, which makes it more likely that differences between estimated and actual demand will be observed. According to the authors' estimates balancing requirements in the Spanish electricity system saw increases in excess of 30% in the year after the market reform. This was translated into an increase of around 0.3 euros/MW h in final electricity bills. The authors recognise that widely adopted smart meters would mitigate the