



Development of EU (European Union) energy market agenda and security of supply



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ABSTRACT

The paper critically discusses the reform of the energy sector in the European Union from the beginnings of the liberalisation processes in 1996 until present. Through EU energy policies and relevant legislation the goals to achieve are sustainable development, security of supply and competitiveness, together with focussing on the needs of customers. The paper analyses all three above-mentioned pillars and customer protection requirements from the viewpoint: customers should have high quality energy delivered at affordable prices. We call for competitiveness to be further underlined by the market. Despite some concerns related to market models, with the latest impetus from the European institutions the market will, and is able to, develop and to integrate also renewable sources. Where the market does not deliver sufficiently, regulators have to ensure customer protection, especially for vulnerable customers in a period of increasing prices.

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1. Introduction

The energy sector in the EU (European Union) underwent a reform process after enforcement of the first Electricity Directive in 1996 and the first Gas Directive in 1998. EU MS (Member States) created significantly different conditions for market participants and customers. The period after the second liberalisation package of Directives and Regulations in 2003 and 2005, improving some of the deficiencies, was still characterised by a sluggish development of the market with a broad range of variety. The European Commission found serious internal market malfunctions in its sectoral inquiry report 2006 [1]. Throughout the EU, except for renewable energy, low intensity in new investment characterised the period since the market introduction, which affected also the security and quality of supply.

With market introduction growing concerns were raised to protect the final customer against loss of energy supply. EU Member States maintained or introduced a number of customer protection mechanisms to protect the customers from losing supply, especially those whose life or health would be endangered in case

of a supply interruption (i.e. vulnerable customers). Some of those mechanisms have remained in operation to date, e.g. regulated tariffs for customers.

A common EU energy policy was developed by the European Commission [2] and endorsed by the Council [3] in 2007 to set the values and policy objectives on which its three pillars are based: sustainable development, security of supply and competitiveness. Integrated energy markets are the most important part of the third pillar. Although they are a part of all later policy documents, more weight seems to be attributed to the first pillar, particularly by the recent policy document Energy Roadmap 2050 [4].

The next milestone in the development of electricity and gas markets was the enforcement of the third energy liberalisation package. In the EU, a new institution was introduced, Agency for the Cooperation of Energy Regulators. Since 2011 the Agency prepared a series of FG (Framework Guidelines). On their basis a number of NC (Network Codes) were drafted and are currently at different stage of development and adoption. European Council decision (2011) sets the next milestone to be the completion of the internal market by 2014 so as to allow gas and electricity to flow freely [5]. This paper discusses recent developments in different parts of energy supply chain and market segments. Various options are discussed and instruments recommended for future development towards sustainability, security of supply and competitiveness through energy markets. The authors strive to recommend options

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which will benefit end customers and contribute to their protection.

2. The main development objective

Development of the energy sector in all its components, along with the values defined in the energy policy, can only be successful and sustainable by having customers as its focus. Sufficient volume of energy has to be available to the customer when required, whereby the necessary volume of energy shall already reflect energy efficiency measures as well as other demand side measures. In addition, energy delivered to the customer shall have high quality and affordable price.

Sufficient energy supply with a “business as usual” approach may only be ensured in short-term. In this case levels of environmental protection, investments into infrastructure, production and knowledge remain similar to those over the past decade. In long-term, sufficient energy volumes may only be retained through substantial amendments of the present paradigm. Additional elements of environmental protection in the whole energy supply chain shall encompass gradual modification of fuel mix, better use of the existing infrastructure, coordinated operation, planning and investments into new infrastructure incorporating an increasing level of knowledge, especially research. Certainly, these measures require resources. To counterbalance their inflatory push on prices, a functioning and integrated energy market is necessary to maintain energy prices for customer transparent and affordable.

The future market development will require some corrective elements. Two of them are further discussed: generation adequacy and protection of vulnerable customers.

The main objective above relates to all customers regardless of their size, social position or other specificities. As the market itself does not provide sufficient protection to vulnerable customers their protection together with a broader question of affordability has to be addressed by additional measures. To that end, national regulatory authorities, organised in the CEER (Council of European Energy Regulators) developed a vision in 2011 which is shared with the EU consumer organisation, BEUC (Bureau Européen des Unions de Consommateurs). That vision changes the past paradigm and puts smaller customers first. It also declares four governing principles for relationship with customers: reliability, affordability, simplicity as well as protection and empowerment. Regulatory authorities are committed to engage and act in ways that promote this vision [6].

3. Sustainable development

Elements of the main objective are reflected in Energy Policy for Europe [2], which defines the three pillars of a common energy policy: sustainable development, security of supply and competitiveness, and sets policy objectives. They could easily lead to divergent and contradictory strategies, therefore a governance framework and later rules have to provide balance.

Overall decarbonisation path of the EU economy will have to be followed by the energy sector and will strongly impact market development. A corresponding Energy Roadmap 2050 [4] was presented by the European Commission in December 2011. It encompasses five decarbonisation scenarios and two current trend scenarios, a reference scenario and current policy initiatives scenario. The latter assumes measures from Energy Efficiency Directive [7] and RES (renewable energy sources) Directive [8] are implemented. It lists ten structural changes necessary for energy system transformation. Among them, electricity will have to play a greater role and increase its share in final energy demand. The portion of household expenditure for energy, including transport,

will increase, and energy savings will become more important. The document also clearly shows the inevitable energy price increase for at least a decade.

The susceptibility of the electricity sector to climate change adds to the complexity. It varies significantly among countries as reported by Klein et al. [9]. This paper analyses for 21 European countries specific influencing factors and introduces an index to measure quantitative relative indication of susceptibility among the countries included. According to their findings, countries show significant difference in susceptibility to climate change, and some which show low susceptibility will become more susceptible in the future. The analysis also identifies those aspects of electricity systems that are vulnerable. Effects of climate change on the renewable power generation, namely wind and solar, in Northwest Metropolitan Region, Germany, are analysed by Wachsmuth et al. [10]. The paper identifies a need for an extension of networks and for the storage of electricity over months. Their model shows impacts of climate change in reducing the need for network extension and storage, but expects their increased volatility.

Further research on developments in sustainable energy and environmental protection, mainly related to the enhanced use of renewable sources, is summarized by Olabi [11] and [12]. Electricity from RES is more competitive on the market in combination with storage facilities. In this field, Carton and Olabi [13] present a study on the potential use of different storage technologies, their contribution and development potentials in Ireland, Denmark and Norway. They propose distributed wind/hydrogen hybrid systems to enhance the efficiency of wind farms with the primary aim to reduce the need for their curtailment and save wasted energy. This will contribute to the security of supply, reduction of backup power, and transmission losses, among others. Projects of that kind were limited to residential and related small energy consumption. For energy intensive industries competitive solutions will have to be elaborated in the EU. Furthermore, Connolly et al. [14] present a study on future energy costs and maximum wind penetration feasible in Ireland. They modelled the Irish energy system and projected the fuel prices up to 2020. They found the Irish energy system being very vulnerable to future fuel and CO₂ prices.

Denmark is among the frontrunners in the use of renewable energy. Lund [15] presented some lessons learnt in Denmark where the planning process and energy policy was a result of a process of conflicts which led to significant technological changes and transformed the national energy policy. Lund's and Mathiesen's analysis [16] shows that Denmark can switch to complete renewable energy systems and the first steps to do this are feasible, however these have to be accompanied by a number of measures. Further scenario analysis for Denmark to be fossil fuel free by 2050 is presented by Kwon and Østergaard [17]. Pillai et al. [18] develop a tool for modelling energy scenarios for Denmark. The model includes hourly and dynamic balancing energy and encompasses electric vehicles as an electricity storage. In some computed cases the operational frequency deviates unacceptably from the nominal value of 50 Hz [18]. However, the system frequency deviation is a component of voltage quality (see Section 4.2) and should remain within the ranges prescribed by quality standards.

4. Security of supply

Three events significantly contributed to raise the importance of security of supply: the decrease of gas supplies by around one third in January 2006, complete interruption of gas supplies in January 2009, and a large electricity system disturbance on the 4th of November, 2006. On that day at around 22:00 h the whole UCTE (Union for the Coordination of Transmission of Electricity), today ENTSO (European Network of Transmission System Operators)

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