Prague Business School Centre for Energy Studies

Sharing Economy and Energy markets

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Abstract Sharing economy is a product of social, economic, societal, and technological changes recently emerging and shaping up in the human society is marked by a high penetration into all sectors of the "traditional" economy. The rise of the World Wide Web (WW) and the Internet as well as the popularity of smartphones and smart meters, smart watches and sensors of various sorts enabled its high effectivity and usage, while the rise of the creative economy and "gig" economy made its application very easy to handle. This paper focuses on innovations brought about by the sharing economy in the field of energy and electricity generation. New trends in energy generation that include distributed energy generation by prosumers who use renewable energy sources such as wind or solar power make the principles of sharing economy to penetrate into the one solid and locked market of energy. One of these issues is peer-to-peer (P2P) electricity trading that is gaining popularity in small communities around the world and is shaping up the way for the future trends. This paper discusses the role of recent technological innovations and the sharing economy in the transformation of the modern energy markets. It makes some interesting points and implications for the future development of energy markets in the light of the creation of the Internet of Energy (IoE).

Keywords: sharing economy; energy; renewables; Internet of Energy; P2P markets; platform markets

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1 Introduction

Technological innovations of the recent decades that brought us the World Wide Web (WWW) and the Internet resulted in the unprecedented changes that created social networks, smartphones, virtual reality (VR), augmented reality (AR) and other exiting novelties.

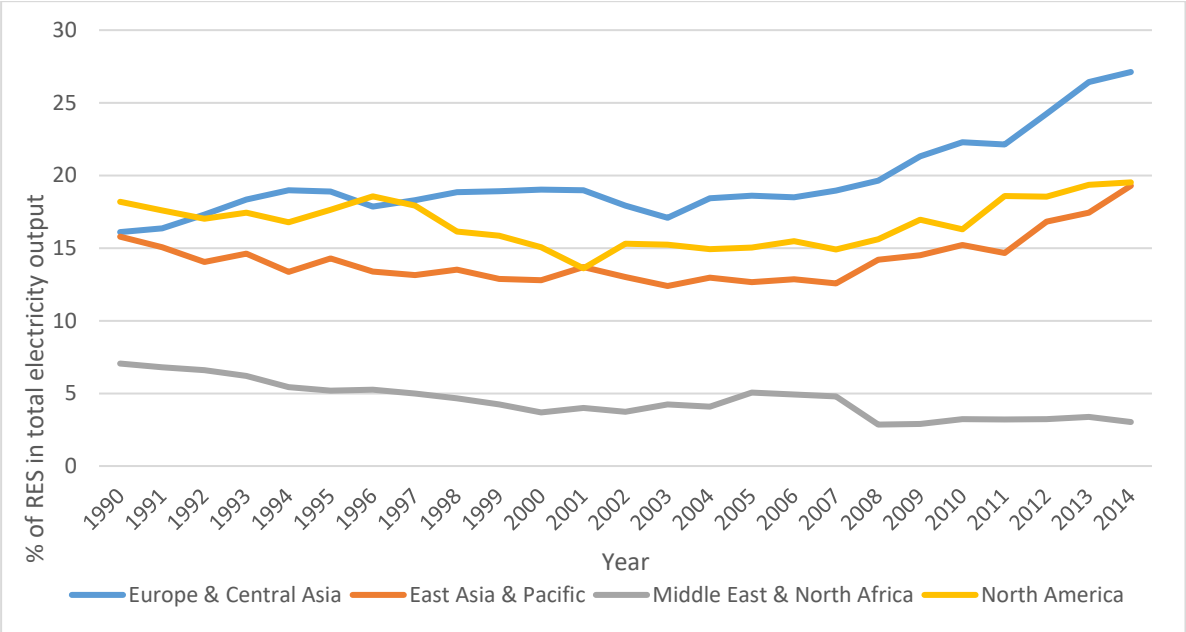
These innovations are changing the way traditional energy grids used to work. While traditional grids were used to carry power from a few central generators to a large number of customers, the growing complexity of the today's globalized world is causing the transformation of traditional grids into the "smart grids" that employing a two-way flow of energy and information in an automated energy delivery network. Thanks to the smart meters, artificial intelligence and autonomic power systems, modern smart grids instantly know where and to whom the electricity should be delivered and react to the changes in demand and supply (see e.g. Carroll et al. 2014; Lisin et al. 2015a, 2015b, 2015c, 2015d; Strielkowski 2016; Streimikiene et al., 2016; Varanavicius et al. 2017; or Strielkowski 2017).

With the pressure on the traditional energy grids intensifying due to the commitment for the low-carbon future made by governments in the majority of Western countries the future of electricity networks will likely to face a number of challenges including the new patterns of consumption, planning under an increasing uncertainty and overall growing complexity due to the large number of small independent devices connected to the network (Strielkowski et al. 2013; Lisin and Strielkowski 2014; Borodkin et al. 2014; Strielkowski and Lisin 2016; or Strielkowski and Bilan 2017).

This low-carbon future and the electrification of transport are closely connected to the increasing usage of renewable energy sources (RES) that are used for generation of electricity. This generation can be done centrally (e.g. on the country's level and supported by governments in a form of, say, large generating facilities, like massive solar plants or wind farms), or at the household (or a group of households) level (e.g. by local communities and stakeholders). It is used mostly for transportation (electric vehicles, or EV) and heating (electric heat pumps, EHP), although other ways for its whole-scale deployment are emerging (Lisin et al. 2016a; 2016b; 2017).

In one way or another, the renewables are slowly but gradually taking their relevant share in the world's generation of electric energy. One can see that the renewable electricity output is rapidly growing in such regions as Europe and Central Asia with East Asia and Pacific quickly gathering pace (see Figure 1 that follows).

Figure 1. Renewable electricity output (% of total electricity output**)**



Source: World Bank (2017)

All in all, it appears that recent technological innovations are causing major transformation of the modern energy markets. The future development of energy markets seems to be marked by the digital technologies based on the social (and neural) networks and the Internet of Energy (IoE).

2 Peer-to-peer energy markets

In the future, producers and consumers of energy on the traditional energy markers be eventually replaced by the energy "prosumers" (agents who would both produce, consume, and trade energy) with the society having to adapt to these changes.

The future of the smart energy markets will depend on the raising popularity of the digital technologies and the sharing economy concept and how they are used in smart grids. However, one has to remember that social acceptance of smart grids should be based on the concept of sustainability. People's attitudes towards the peer-to-peer electricity markets that are brought about by the recent developments and changes in transportation (electric vehicles), housing (smart homes), as well as energy generation and transmission (Internet of energy). This is where peer-to-peer (P2P) markets of energy are becoming to play an important part (Einav et al. 2016).

P2P market represents a "platform market" or a "two-sided market" which is a multi-sided market where an intermediary captures the value of the interaction between user groups (Weiller and Pollitt, 2016). Beginning from the work of Rochet and Tirole (2006), these types of markets gained popularity in economic thinking and found its way into the energy economics and policy. Table 1 shows four different types of P2P platform models.

Table 1. P2P platform models

Vendor platforms	**Retail platforms**
Offered by DER vendors to offer their products and/or to reduce charging costs of electric vehicles (sonnenCommunity, Germany)	Value-added service suppliers differentiate their offer using P2P energy-trading platforms in retail markers (Piclo, United Kingdom) and Vanderbron, Netherlands)
Blockchain platforms	**Microgrid platforms**
Blockchain smart contracts use a secure decentralized blockchain protocol to manage transactions (Brooklyn Microgrid's P2P energy-trading platform, United States	New strategy for prosumers to support the formation of microgrids and community energy (Brooklyn Microgrid's P2P energy-trading platform, United States)

Source: Own results based on Robert et al. (2016)

3 Sharing economy and energy markets

Sharing economy is, in fact, an economy of direct exchange between people that became the modern-day phenomenon. It is based on a simple principle that can be shaped up as the following: “if I need a nail in the wall, I do not need to buy a hammer for that when I can just borrow it”.

Sharing economy and the P2P model profit from the advancement of information and communication technologies (ICTs) and the adaptation of these ICTs by the general public (Munoz and Cohen 2017). Millions of people use Facebook, Twitter, Instagram and other social networks and are getting familiar with interacting and cooperating with the total strangers via Internet. There would have been no sharing economy without the social networks. The evolution of ICTs into sharing economy was done in four consecutive phases and it can be demonstrated on Figure 2 that follows.

Figure 2. Evolution of ICTs into sharing economy

Source: Own results

The best well-known examples of sharing economy are Airbnb, Freelancer, oDesk, Prosper, Etsy, Kickstarter, Transferwise, Taxify, or Uber that offer transport, hospitality services, financial services or crowdfunding for start-ups. In short, they are platforms that enable users to access different types of services and products through direct interactions between buyers and sellers.

With regard to the above, one can clearly see how the principles of sharing economy can be applied to the energy markets. The emergence of the new technologies such as advanced solar energy generation, and the subsequent use of solar and battery systems, presents immense cost savings not only for the end-consumer but also utility companies (Hirth 2013). What is important to note is the fact that these new emerging technologies do not require large investments and individual consumers, or end-users, could generate and use their own electricity within their respective locations. Such changes could have far-reaching effects on other downstream elements of the industry, such as distribution, pricing, and retailing of electricity and energy in general. The majority of the existing successful P2P electricity trading platforms employ various advanced ICT technologies (e.g. blockchain technology) that allow electricity suppliers and consumers to acquire information and conduct transactions and that resemble the principle of sharing economy.

4 Conclusions

Overall, it becomes apparent that new technological advantages enabled the creation of the new system of energy generation and trading that can involve not only large generating companies, but also individual households represented by the energy prosumers. This system is based on the electricity production and consumption devices that are connected to the network and some sort of smart meters controls the amounts of energy the prosumer produces and consumes and monitors the demand of other consumers in the same grid.

P2P energy markets that are based on these principles and that employ the know-how gained from sharing economy will certainly change the way the energy is generated, transmitted and used. In the nearest future, everyone will become a prosumer operating within the social networks of the Internet of Energy.

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