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Economics of electricity pricing and consumer protection

Abstract
Consumer protection and electricity pricing issues that emerge when consumers generate their own electric power by installing solar photovoltaic (PV) panels (known as solar distributed generation, or DG) nowadays are in the centre of interest of public administration and citizens as far as it concerns energy supplies of households and new inter-relations which occur as the result of technological advance. Despite the fact that the output of a solar panel cannot be precisely predicted, the marginal cost of generating electricity from the renewable energy sources is nearly zero. This made renewable sources with the inclusion of solar panels the first choice for utility firm in fulfilling its customer's energy demand.
We look into the economics of electricity pricing and issue of consumer protection associated with the distributed generation in the developed economies by the example of the USA. Our results might help the stakeholders and policy-makers as well as energy companies to obtain a deeper insight on this problematique. Given that the United States are dangerously affected by climate change, the use of solar renewable energy would be of great benefit in controlling the environmental hazards caused by the use of non-renewable energy on the environment. The government and other socially influential stakeholders must initiate and further participate in the public awareness campaign concerning policies, the concept of net metering and the pricing of solar products.
Keywords: Energy Economics; Electricity Pricing; Consumer Protection; Distributed Generation; Solar Photovoltaic (PV) Panels; Solar Energy; USA
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Економіка ціноутворення на електроенергію та захист прав споживачів
Анотація
Специфічні проблеми захисту прав споживачів та ціноутворення на електроенергію виникають, коли споживачі починають генерувати власноруч електроенергію, використовуючи фотоелектричні панелі, також відомі як панелі розподіленого генерування енергії. Ці проблеми швидко привернули увагу владних структур і суспільства.
Ми розглядаємо економіку ціноутворення на електроенергію та питання захисту прав споживачів, пов'язані з розподіленим генеруванням енергії, на прикладі розвинених економік світу, а саме, США. Уряд та інші зацікавлені сторони мають ініціювати й активно реалізовувати просвітницькі кампанії щодо концепції виробництва електроенергії з відновлювальних джерел та ціноутворення на відповідні продукти сонячної енергетики.
Ключові слова: економіка енергетики; ціноутворення на електроенергію; захист прав споживачів; розподілене генерування; сонячна енергетика; США.

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Экономика ценообразования на электроэнергию и защита прав потребителей
Аннотация
Специфические проблемы защиты прав потребителей и ценообразования на электроэнергетику возникают, когда потребители начинают самостоятельно производить электроэнергию, используя фотоэлектрические панели, известные также как панели распределённого генерирования энергии. Эти проблемы справедливо привлекают внимание властей и общества.
В статье мы рассматриваем экономику электроэнергетики и вопросы защиты прав потребителей, связанные с распределённым генерированием энергии на примере развитых стран мира, в частности, США. Правительство и другие заинтересованные стороны должны выступать инициаторами и непосредственно участвовать в просветительских кампаниях, продвигая концепцию производства электроэнергии из возобновляемых источников, а также подходы к ценообразованию на соответствующие продукты солнечной энергетики.
Ключевые слова: экономика энергетики; ценообразование на электроэнергию; защита прав потребителей; распределённое генерирование; солнечная энергия; США.

1. Introduction

The electric power business is a crucial issue for many developed economies which impact implicitly individuals in every nation. Different from most other industries, the electric power business is controlled by various measures at the regional, country, and federal levels. Retail electric services remain sanctioned monopolies to some level in each state since components of their activities have been seen as fundamental monopolies (Kasperowicz, 2014; Brooks, 2015; Kasperowicz & Streimikiene, 2016; Oliva et al., 2016; or Hess, 2016) [1-5]. As a result, retail electricity tariffs are not defined by the market but are supervised by state regulators, such as the public utility commissions (PUCs), or local officials.

In some cases legal regulations demand electric power delivery services that retail electric energy to domestic and commercial consumers to recompense clients for the energy they produce from latter's solar photovoltaic (PV) rooftop panels. Customer can either get a decrease in a customer statement in case when consumption exceeds own production, or backpayment from the service company when client's production surpass consumption. This method is widely known as «net metering» (Pool, 2012) [1; 6]. Amongst the countries that actually apply this method are Australia, Canada (in Ontario province), some EU countries (Denmark, the Netherlands, Italy, and Slovenia), and the United States. Many other countries are considering this innovation (Thakur and Chakraborty, 2016) [7]. Choosing specific approach to the net metering is another complicated issue. Most countries or regions in the above-mentioned countries that have embraced net metering have decided to re-compensate solar distributed generation (DG) consumers at the level of local rate for customers of the electrical power within the existing grid. Application of the retail rate is easier for customers: the power they produce with solar photovoltaic (PV) panels the value equal to the price of electric power from the grid. There is a strong discussion on this approach to re-compensation for solar DG: some maintain the true value for solar DG is beneath the retail charge (Picciariello et al., 2015) [8], while others think the right value is at or even above the retail charge (Kildegaard and Wente, 2015) [9]. Establishing the true price upon many factors, covering issues that are less specific to the solar DG but rather depend on retail rates composition.

Some see regulated retail prices as a mean for adjustment of both fixed and variable tariffs, which enables effective operability of the services (Nikolaidis et al., 2015) [10]. In this sense, counterbalancing solar DG clients at the retail price enables these clients to deduct considerable portion of the price by moving these costs to consumers who have not fixed solar PV panels. Advocates of this view claim that the price benefits fund for solar DG should be confined to the typically moderate price utility fund for most other types of production on the commercial market.

2. Literature review

Resources of distributed energy consist of small-scale technologies for generation of power which are situated near homes and businesses where electricity is used. Distributed generation (DG) offers either an improvement of or an alternative to the traditional supply from large-scale centralized production locations. DG enables the production and establishment of power in a shorter period than it is needed to construct or develop new central power systems. It may be positioned at or close to consumers' locations to attain particular needs of the customers and as well to provide small energy quantities into home-grown markets (Marques & Almeida, 2013; Urbaniec, 2015) [11-12]. It has developed as a substitute for purchased power as it has a number of advantages in the perspective of the provision of electricity, heat, light and mechanical energy. In the United States and worldwide, DG is the cleanest nationwide source of energy available. Solar products contribute to dealing with national main concerns, such as economic growth, internal security, mitigation against climate change, and employment opportunities.

According to Lisell and Mosey (2010) [13], distributed energy eliminates the cost needed for installing new transmission lines. Moreover, it reduces energy supply losses making it possible to conserve vital resources of energy, favours the use of renewable resources like windmills, biomass cogeneration, and rooftop solar photovoltaic systems. Likewise, it improves the traditional energy use in devices like fuel cells and natural gas micro-turbines resulting in increased efficiency of producing energy to cut costs of operations, rates of resource consumption and pollutants. Through DG possible blackouts are eliminated as a result of reduced margin of utilities for generating reserve volume in some areas of the state. Photovoltaic (PV) solar panels directly convert sunlight into electricity.

At the moment, DG has partly grown due to the fact that companies have entered the market to provide customers different finance, lease and agreements for power hardware purchases. For the market to function properly it is necessary that consumers get the access to information on financial costs and benefits of different options of solar PV panels. Even though distributed energy is progressively more important in meeting the energy and environmental objectives of the United States, installations of rooftop solar panels is still facing with problems concerning consumer protection. Evidently, consumers lack vital information regarding the distributed generation, and as a result, many companies are exploiting these uninformed consumers in a number of ways (Deline et al., 2011) [14].

Various firms which are leasing solar products are engaging themselves in sales malpractices. The companies take advantage of consumers with no knowledge of what they should pay for electricity and the solar PV panels. Moreover, some customers do not understand under which circumstances their payments shall rise as per the agreements. For instance, cost savings of energy which some PV corporations claim in their transactions fields are frequently higher compared to the real savings as they used cost predictions assumptions which were highly inflated. In several cases, because of automatic increase terms set in solar leases, buyers end up compensating more for the solar energy compared to that they would have compensated traditional energy firms at the meter rate. Further, consumers are unaware that these payments might double in the course of the lease contract. Also, they do not know the amount of interest rate charged, though these types of requirements are clearly stated in cases of short-term car leases.

At a place like Arizona the sun is a nearly ever-present resource, but most of bad actor PV firms have charged in court many consumers for failing to connect solar systems after making a deposit and also have been illegally soliciting the customers through phone calls on the numbers listed on the National Do Not Call Registry to exaggerating the solar savings. In March 2016, a federal court action was filed by the FTC, which alleged that 1.3 million individuals on the Do Not Call Registry list were victims of unlawful telemarketing entities who acted for various solar companies. The phone calls are just a case amongst much deceptive advertising, wrong information, irritating sales campaigns, faulty installations and undisclosed charges and other complaints from consumers. Vividly, an example of overstated savings techniques is from a local media station in Georgia that made a video record of a salesman for PVs making blown up promises to consumers and highly overstating the yearly savings from solar system installation. In Louisiana, a company misled customers through exaggerating energy cost savings, failure to fix the solar equipment timely, and violation of national license prerequisites for PV installers (Li & Yi, 2014) [15].

3. Electricity pricing issues

A number of laws and jurisdictions oblige utilities distributing electric power tore-tail customers to reimburse clients who generate power from PV panels. For instance, in the United States the laws for reimbursement to consumers are prepared and initiated by the Federal Trade Commission (FTC, 2016) [16]. Compensation may be in the form of reducing the consumer's bill where the consumption is higher than what the customer generates or paying the consumer from the utility where more electricity is generated than what is consumed. The practice is widely referred to as net metering. It is

a system for billing which credits small consumers at a complete retail electric price for all the extra electricity generated and sold by these customers to the local electric firms through the grid (Shrimali and Jenner, 2013) [17]. People who have installed the PV solar panels benefit from net metering through a reduction in the use of fossil fuel.

Moreover, the utilities state that it provides the owners with a free pass to pay their fair share of conserving the electric grid. Many net metering policies require utilities to purchase a DG consumer's extra power at a total retail price even though the cost of producing the electricity by the utilities is much lower. Because it is the responsibility of the utilities to maintain these electric grids, they shift the cost to the consumers and as a result, the cost of electricity increases. Furthermore, these chargers are further shifted to non-solar consumers which in turn increase their electricity bill caused by net metering. Determination of the right rate for net metering is a complicated issue. The subject regarding electricity prices is on the appropriate retail rate at which to compensate consumers for DG. There is a debate on whether the price to be used to compensate the distributed energy consumers should be below or at the retail rate.

It is evident that utilities are not the only sector impacted by the rapid growth of distributed generation resources. Following the growth of solar DG in Europe, there has been a drop in the prices of solar panels in the USA owing to manufacturers producing them in large quantities by about 12% in 3 years from 2012 to 2014 (US Department of Energy, 2014) [18]. Owing to increased utility rates, renewable portfolio standards and time-of-use rates which are higher during peak-demand hours, utility customers have found it more affordable to install solar PV in their homes in a bid to reduce electricity costs (APPA, 2013) [19]. However, utility companies are opting to recover lost revenues from DG customers by transferring these costs to the remaining retail utility customers. Given that the government offers subsidies for renewable energies and levies for carbon emission, it proves to say that DG customers are subsidized by non-DG customers (APPA, 2013) [19]. According to three California utilities estimate is that the costs brought about by lost revenues were spread evenly among over 7 million traditional utility customers, where each customer would have an increase in annual electricity costs of USD 200 (EIA, 2016) [20]. This would have a rather negative impact on most of the general population who rely on utility companies for electricity, especially those without the capability of becoming DG. In the USA, DG customers are usually individuals with higher incomes than those that rely on utilities.

4. Consumer protection

Direct access to sunlight is a key requirement for solar panels to operate efficiently. Installation of solar panels on new or existing buildings may often require modifications to accommodate the panels. These modifications are subject to building codes and private regulations thus they pose a challenge for those planning to install panels (Kettles, 2008) [21]. Solar access may not only be hindered by potential shading of the solar collectors by neighbouring structures, but also by public and private restrictions on property use. These may include restrictive covenants such as deeds, condominium, homeowner association bylaws, architectural control and local government ordinances (Kettles, 2008) [21]. Solar access can be categorized into two areas - solar easements and solar rights. Solar easements address the ability of one property to receive sunlight across property lines without any obstruction from another person's property (Kettles, 2008) [21]. In the USA, the general principle of law which is currently in effect is that any landowner has the right to at least as much of the air space from the ground that they can occupy or use in connection with the land and given that they do not occupy it in a physical sense (Duke and Attia, 2015) [22]. In residential communities, it is common to encounter condominium and homeowner associations. Condominium associations are corporate organizations which usually govern their affairs according to duly adopted bylaws which are included in within the declaration of condominium. Homeowners association is an organization consisting of property owners within a subdivision essentially assuming the role of a residential private government (Kettles, 2008) [21]. Solar rights address the ability to install solar energy systems on residential and commercial property which may be subject to private restrictions (Kettles, 2008) [21].

In the United States, solar easement statutes usually have common elements and are mostly voluntary. This means that a solar owner cannot require their neighbour to agree to a solar easement. Registration is a common mandate used by the state to allow a home owner to register their solar system. This is done by a local governing body thus notifying the neighbours of the solar system's presence. This allows the solar owner to impose a solar easement on their neighbour. Other states require the local governing body to put a requirement of a solar access element in subdividing land or in their development plans submitted for approval. However, this measure only protects solar access in the case of new construction units (Kettles, 2008) [21]. Solar rights have been perpetuated based on two models. The first model addresses local government ordinances and the second model addresses land use restrictions (Kettles, 2008) [21].

Individual states of US have numerous laws or regulations regarding electricity supply and demand. The most dominant of all these policies is the renewable portfolio standards (RPS) whose policies require electric utilities to generate or purchase renewable energy that is equal to a given percentage of their retail electricity sales or a set minimum quantity within a specified time-frame. «Demand-related policies usually include energy efficiency mandates, utility energy efficiency programs, demand response/shifting and technologies such as smart meters» (Sterling et al., 2013, p.7) [23]. Utility firms in the USA dominate the investments in energy supply chains, and it was noted that as of 2015, all the renewable energy generated within the country came from utility scale facilities (Bolinger et al., 2015) [24]. In a bid to increase renewable energy investments, governments within various states provide direct subsidies, such as investment tax credits and cash grants, as well as indirect subsidies, such as carbon tax. Despite the fact that the output of a solar panel cannot be precisely predicted, the marginal cost of generating electricity from the renewable energy sources is nearly zero. This made renewable sources with the inclusion of solar panels the first choice for utility firm in fulfilling its customer's energy demand (Abdmouleh al., 2015) [25]. Utility firms usually determine their electricity price as well as various other renewable and conventional energy investments to its existing offer with a view of maximizing profits following a pricing policy that has been mandated by the government. They usually opt to invest in the new conventional and renewable energy sources based on the fact that the new energy sources generate electricity at a lower cost as compared to its existing fleet. Normally, flat pricing leads to a higher energy investment in solar energy as compared to peak pricing. This can be attributed to the fact that under flat pricing the energy demand is higher during the daytime thus making the utility companies invest more in solar energy in a bid to fulfil the increased demand since solar energy is generated during daytime with negligible costs. However, research carried out has also shown that peak pricing can increase the investment level of solar energy for distributed generators. Focus has mainly been drawn to investment by utility firms due to their dominance in capacity investment for electricity (Kok et al., 2015) [26].

5. Conclusions

The rapid success of DG brings in a plethora of issues and challenges. There are several market barriers as well as grid installation problems. Evidently, consumers are being exploited by unscrupulous companies which offer solar products without their knowledge (Strielkowski, 2016) [27].

Also, the challenges of customer protection are of major concern as most of them do not have relevant information on policies regarding degenerated energy. The problem of increasing electricity prices is also adversely affecting the development of solar DG. Therefore, the government and other stakeholders must intervene and enlighten people on the policies,

the concept of net metering and the pricing of solar products. Given that the United States are dangerously affected by climate change, the use of solar renewable energy would be of great benefit in controlling the environmental hazards caused by the use of non-renewable energy on the environment.

When businesses produce or buy energy from massive solar plants, they spread the charges out smoothly to consumers. Each dollar consumed on rooftop solar is a dollar not spent on additional, more prolific renewable sources. Frequently, businesses across the nation have been asking questions to the predicaments with rooftop solar. They have been advancing the study of large-scale solar and other renewables, the balance of rooftop solar payments and a restructuring of charged prices to promote new technologies.

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