



Online Load Shifting of Electricity Production-Consumption for Reducing Environmental Hazard

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Abstract

Demand of energy and environmental problem forcing us to take new solutions to reduce more energy production, consumption and also for the different solutions we have to put into practice. For devices that use electrical energy of the most important energy source. A result of increasing the area of use is also increasing demand for electrical energy. Electricity consumption and production variability over time, it is exactly the result of we could not planning of necessarily produced more electricity. Therefore, more efficient use of resources in the one which is also to produce as much electricity as needed. Electricity production is the main source of electricity production in thermal power plants, given the variability in consumption is not possible to be adjusted according to the technical. Because of the difficulty that consumers need to produce as much electricity as needed at times to guide the use of some of the electricity needs. For this, the country in general and with the need for regional electricity generation online to track and classify it as more than the consumption of electricity price increase lately. During hours when electricity demand is the same way, at least to reduce the price. In this study, eight different classifications are recommended. Instant electrical lines as a classification based on the signals sent over the electricity supply with power line and demand, consumers will be displayed with the digital display. Intelligent systems will be controlled by adjustable electric consuming devices. The new smart power devices will help to the consumers for using their electrical devices in cheap price intervals. In the same way by means of signals sent from the center of the current classification of smart electricity meters may be charged for electricity consumed. Environmental and economic benefit obtained by reducing differences between the excessive consumption and production.

Keywords: Electricity, price classification, load shifting, environment, climate change.

Çevre Tehlikesini Azaltmak için Online Elektrik Tüketim ve Üretim Yük Ayarlanması

Özet

Artan enerji talebi ve çevreye zararı yeni çözümler aranmasını ihtiyaç haline getirmektedir. Tüketim ve tüketimdeki düzensizlikler fazla elektrik üretimine yol açmaktadır. Elektrik enerjisi kullanım alanındaki artış dolayısıyla yeni enerji kaynaklarına ihtiyaç vardır. Zaman içerisinde elektrik tüketim ve üretimindeki salınımlar iyi bir planlamayı gerektirmektedir. Bu yüzden, enerji kaynaklarının verimli ve planlı kullanılması gerekmektedir. Elektrik üretiminin daha çok termik santrallerde yapılma çevre problemini de beraberinde getirmektedir. Termal elektrik üretim santrallerinde tüketime bağlı olarak üretimi ayarlanmanın zorluğu sebebiyle tüketimde ani tüketimlerin ayarlanması fazla üretimin azalmasına ve dolaylı olarak çevreye verilen zararın azalmasına katkı sağlayacaktır. Üretim ve tüketim arasındaki dengesizliği azaltmak amacıyla ulusal ve bölgesel olarak çözümler yapılabilir. Bu çalışmada üretim ve tüketim arasındaki dengesizliği azaltmak amacıyla hali hazırda kullanılan sistemden farklı bir yöntem önerilmektedir. Önerilen sistemde elektrik tüketimine bağlı olarak elektrik tüketim ücretlendirilmesi online olarak 8 farklı kategoride tüketiciye elektrik hatları üzerinden sunulacaktır. Elektrik kullanım yerlerinde göstergeler ve akıllı cihazlar kanalıyla tüketiciler elektriğin fiyatının ucuz olduğu saatlerde acil olmayan ihtiyaçlarını gidermeye teşvik edilecektir.

Anahtar Kelimeler: Elektrik, ücret sınıflandırılması, yük kayması, çevre, iklim değişimi.

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1. Introductions

World population is increasing and urbanization is rapidly growing primarily as a result of industrialization and other offered opportunities. Global energy demand is set to rise dramatically and it increase energy prices. Generally, the excessive demand for electricity is increasing in development and developing countries for every year. In addition to population growth, electricity demand is also increasing depending on growing comfort requirements with have significant adverse effects on the environment, ranging from the global climate change impact to a variety of local impacts. Economic benefits and environmental awareness are most important advantages of sustainable development. Adverse impacts to ecological system are evident from the decreasing energy consumption or using energy efficiently. Electric consumption, as one major source of air pollution is very important for the human life Toros et al., 2013; Erçelebi and Toros, 2009)

Bilen et al. (2008) presents a review of the potential and utilization of the fossil fuels and the renewable energy sources. They emphasize that about 70% of the total worldwide primary energy used is lost throughout the energy supply chain, starting with the production and transport of energy all the way to its final consumption and there is increasing consensus in both the scientific and political communities that significant reductions in greenhouse gas (GHG) emissions are necessary to limit the magnitude and extent of climate change.

Energy demand is increasing in some countries more than other and one of them is Turkey where an increasing population and a rapid economic development are causing more energy consumption in parallel to its economic growth. The energy demand of Turkey is growing about 7% annually and one of the highest rates in the world so considerable attention has been focused on the energy resources and energy policies in Turkey. All other countries Turkey must come up the plan to reduces the share of fossil fuels, increases energy production, and changes the course of long-term energy plans into very effective and applicable solutions (Hacisalihoglu, 2008; Balat, 2008; Kilic and Kaya, 2007).

There are many techniques like efficiency of electrical equipment to reduce electricity production but one of them is regulation production and consumption of the electricity. Generally price classification is used for this purposes most of the electricity suppliers, (ASME, 2009). Power line communication can use for different aim due to an advance in

communication and modulation methodologies in adaptive digital signal processing and many techniques to modulate digital signals onto the power lines. The advanced in technology make signal modulation and error control coding happen to make power line communication possible, (Komine et al. 2003; Pavlidou et al. 2003; Lin et al., 2002; Yousuf, 2008, Auffhammer et al., 2008).

The goal of this study is regulation of electricity production consumption balance using classification of prices and sending this signal to consumer via electric power transmission. The system is suitable for a region or a country where there is a network for production and consumption of the electricity. It will take a time for practical use but the system very important to reducing of the damage of world ecology and the benefits of the system will contribute to a sustainable of the world.

2. Data and Methodology

There are more methods for regulating of production and consumption of electricity and the availability of each method may change region to region or country to country. This method is planning of regulation electricity production and consumption instantaneously by classification of electricity demand with timing of users' energy demand in order to use scarce energy resources most efficiently. In this method covers supply and demand of electricity production and consumption by classification from one to eight for given price advantage. This classification is made by the center of the national electricity production. To be classification historical electrical load of the national network country, one or more year's data will be used to see maximum, minimum and periodicity. A signal of classification will deliver to consumers via electric wires (Figure 1). Classifications can be seen by consumer with a visualization equipment instantaneously low fixed-charge tariff.

3. Result and Discussion

Reduction of megawatt-hours means into avoided approximately 7 metric tons of carbon dioxide emissions, (EPA, 2012). Electricity consumption is 241,974,000 MWh in 2012 (receipt at 18 Jan 2013 from <http://www.teias.gov.tr/yukdagitim/>). It can be seen from below that 16,938,180 tons CO2 can be reduced if only system is reduced 1 % of electricity consumption.

Estimating CO2 Emissions Reduction (tons CO2)= Total Electricity Consumption (MWh)* Reduce % in electricity consumption * CO2 Emissions (tons CO2)= 241 974

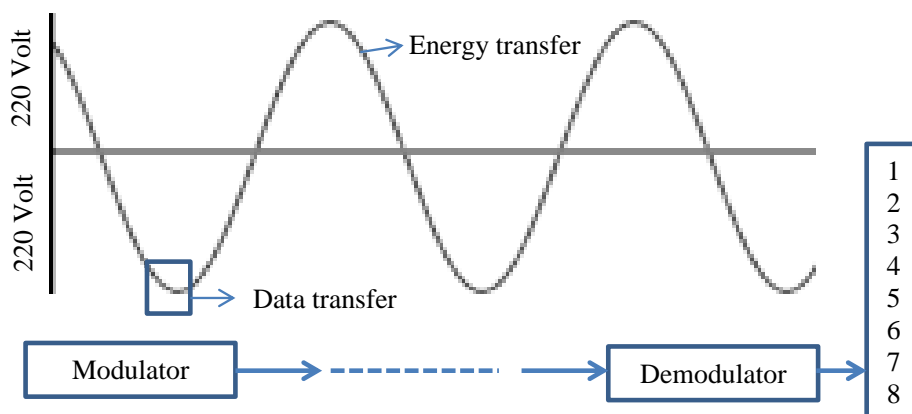


Figure 1. Sending the signal from supplier to the customer

000*0,01*7=16 938 180 tons CO2.

There is static system that three periods; day, peak, and night, according to the demand for regulation production and consumption of electricity in Turkey. Currently, the smart meters to consumers who wish to reduce this imbalance tariff is applied for up to 3. These tariffs are; day - (06:00 - 17:00), maximum (Peak) - (17:00 - 22:00), night - (22:00 - 06:00). Night rate tariff is the cheapest of them is about half the day (Figure 2). Evening hours is the maximum demand tariff is 4 times more expensive than the electricity price per night. This system is beautiful and attractive, but different systems are in place to put the balance of consumption. The fluctuations of electricity consumptions will be regulated with online electricity prices and in electricity demand affect electricity prices, the prices can change in real time. Electricity consumption fluctuations lead to a price projection for near future depends on history data due to real-time online price system. Private sector has also can be improve their electricity price system.

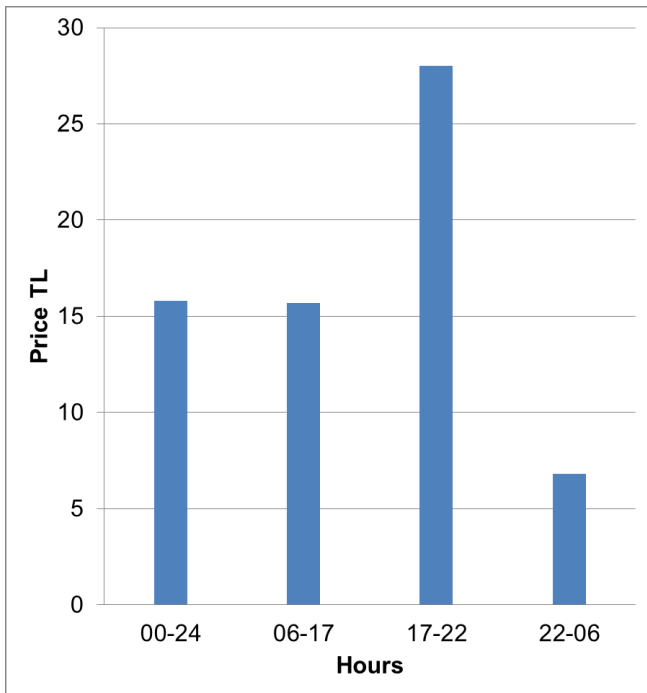


Figure 2. The price of electricity at April 2013 in Turkey

As seen Figure 3 daily electric consumption began to increase after 08 AM morning and began to decrease after 18 PM. Increase in electricity consumption in the evening last designed 3-stage price policy is not in line with the daily electricity consumption. We suggest users online price that policy would be minimize daily consumption

4. Conclusion

Main source of our energy today originated from fossil fuels. Excessive use of fossil resources, used largely due to the generation of electricity and heat, brings with it many environmental disasters for example global climate change. By the way increased energy requirements of tomorrow are a threat to fossil resources because it is limited. Increasing our needs increase energy demand and on top of it waste of energy incumbent on us for the elimination and prevention of waste. The burning of fossil fuels and deforestation main negative effect is to increase greenhouse gases in our atmosphere and a big problem of humanity is climate change. Reducing with more efficient use of energy worldwide must also be part of its solution. Central and local point of production and consumption balance of reclassifications made to reduce the excess production. Consumer can consume the electricity when the prices are low using smart power systems. Waste of resources is avoided. Most of the tools and equipment will produce as smart power controlling systems. Production and consumption of the electricity will be regulated automatically depending on the needs of the consumer. The cleanest energy is not waste of source. Interests of the citizens without any legal obligations with respect to time due to the optimum balance between electricity production and consumption will occur. Our system which is prefers online tracking of consumption and production of electricity and classifying it with demand.

This study will extendible with national plus regional controlling system and with intelligent systems. Intelligent systems will be controlled by adjustable electric consuming devices. The new smart power devices will help to the consumers for using their electrical devices in cheap price intervals. In the same way by means of signals sent from the center of the current classification of smart electricity meters

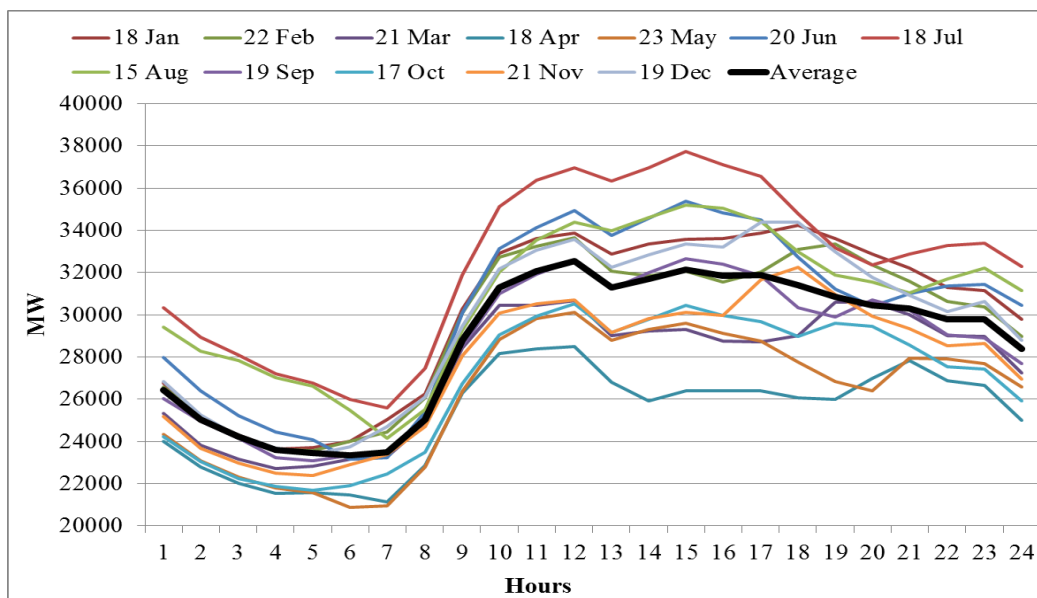


Figure 3. Daily electricity consumption variability for every 3rd week Wednesday on 2012 in Turkey

may be charged for electricity consumed.

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