UDC 658.26
JEL G30

A COMPARISON OF THE PRICES FOR ELECTRICITY NETWORK SERVICES IN THE REGULATED AND FREE MARKET

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Sharing the costs for balancing the electricity system is an important step towards full liberalization of the market, in line with the other countries in the European Union, where all clients pay the costs for balancing energy system. It can't be denied the indisputable progress of the liberalization process of the Bulgarian electricity market. The topic of "liberalization" is no longer unknown to stakeholders in the energy sector, from both the supply and in demand stand points. In the article the key problems of the creation of a free energy market for a streamlining of production costs, improving the energy efficiency and introducing competition in the sector in Bulgaria are generalized. Thus, the article is considered aspects of switching from scheme of "Single buyer" to scheme of "Bilateral agreements". Also, the comparison of the prices for network services in the regulated and free electricity market is conducted. As a result of conducted research there was concluded that Bulgarian energy sector needs changes.

Keywords: *electrical efficiency prices, balancing the electricity system, price "obligations to society", liberalization.*
Fig.: *3.* ***Tbl.:*** *2.* ***Formulae:*** *1.* ***Bibl.:*** *10.*

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УДК 658.26

Ангелова І. С. Порівняння цін на послуги електромереж на регульованому й вільному ринках

Поділ витрат для балансування системи електропостачання Болгарії є важливим кроком на шляху до повної лібералізації ринку, поряд з іншими країнами Європейського Союзу, де всі клієнти оплачують витрати на балансування енергетичної системи. Не можна заперечувати прогрес процесу лібералізації болгарського ринку електроенергії. Тема «лібералізації» тепер відома зацікавленим сторонам в енергетичному секторі з погляду як пропозиції, так і попиту. У статті узагальнено ключові проблеми створення вільного енергетичного ринку в Болгарії для оптимізації витрат виробництва, підвищення енергоефективності та конкуренції в секторі. Розглядаються аспекти переходу від схеми «Єдиний покупець» до схеми « Двосторонні угоди», а також порівнюються ціни на мережні послуги на регульованому й вільному ринках електроенергії. У результаті проведених досліджень був зроблений висновок про необхідність змін в енергетичному секторі Болгарії.

Ключові слова: *енергоефективні ціни, балансування системи електропостачання, ціна «зобов'язання перед суспільством», лібералізація.*
Рис.: *3.* ***Табл.:*** *2.* ***Формул:*** *1.* ***Бібл.:*** *10.*

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УДК 658.26

Ангелова И. С. Сравнение цен на услуги электросетей на регулируемом и свободном рынках

Разделение затрат для балансирования системы электроснабжения Болгарии является важным шагом на пути к полной либерализации рынка, наряду с другими странами Европейского Союза, где все клиенты оплачивают затраты на балансирование энергетической системы. Нельзя отрицать неоспоримый прогресс процесса либерализации болгарского рынка электроэнергии. Тема «либерализации» теперь известна заинтересованным сторонам в энергетическом секторе с точки зрения как предложения, так и спроса. В статье обобщены ключевые проблемы создания свободного энергетического рынка в Болгарии для оптимизации издержек производства, повышения энергоэффективности и конкуренции в секторе. Рассматриваются аспекты перехода от схемы «Единый покупатель» к схеме «Двусторонние соглашения», а также проводится сравнение цен на сетевые услуги на регулируемом и свободном рынках электроэнергии. В результате проведенных исследований был сделан вывод о необходимости изменений в энергетическом секторе Болгарии.

Ключевые слова: *энергоэффективные цены, балансировка системы электроснабжения, цена «обязательство перед обществом», либерализация.*
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The creation of a free market is one of the aims of reforming the energy sector. Transition from the state monopoly to a competitive environment is a serious challenge for all energy companies. In the regulated market the prices are set by the regulatory authority regardless of how effective they are. The low energy prices and absence of competition led to the lack of motivation to improve energy efficiency. The negative effect of the irrational use of resources has spread to other sectors of the economy and is reflected in the final price of each product. The result is the reduced competitiveness and energy efficiency. For these reasons, the creation of a free energy market is the best way of streamlining the production costs, improving the energy efficiency and introducing competition in the sector.

The *aim* of the article is to develop recommendations for transferring from the single buyer model to bilateral agreements model that involves many buyers and sellers.

Before the liberalization of the energy market in Bulgaria, there existed only the so called "single buyer model", under which manufacturers had to sell their entire production to the Public Provider (National Electricity Company – NEC), which resells the electrical power (EP) to the electricity distribution companies [1]. It is characteristic that the prices for electrical power throughout the chain of production, transportation, distribution and consumption are regulated and common, i.e. without clearly reported difference in production costs and expenditures on operation and maintenance of the network. Consumers pay a total

price for electric power without being able to choose a supplier [4].

The free electricity market was launched in September 2004 by the first recording of the delivery of the first schedule at the agreed prices between NPP "Kozloduy" and "Umicore Med". The new selected market model provided for a phased opening of the electricity market for consumers through the introduction of minimum annual consumption, starting from the largest industrial enterprises representing the heavy industry in Bulgaria – mining, metallurgy, chemistry, cement ones. For the manufacturers there were introduced quotas, which distinguish quantities in free prices and quantities in regulated prices for the needs of small business and residential subscribers.

Fig. 1 depicts the so called "single buyer model".

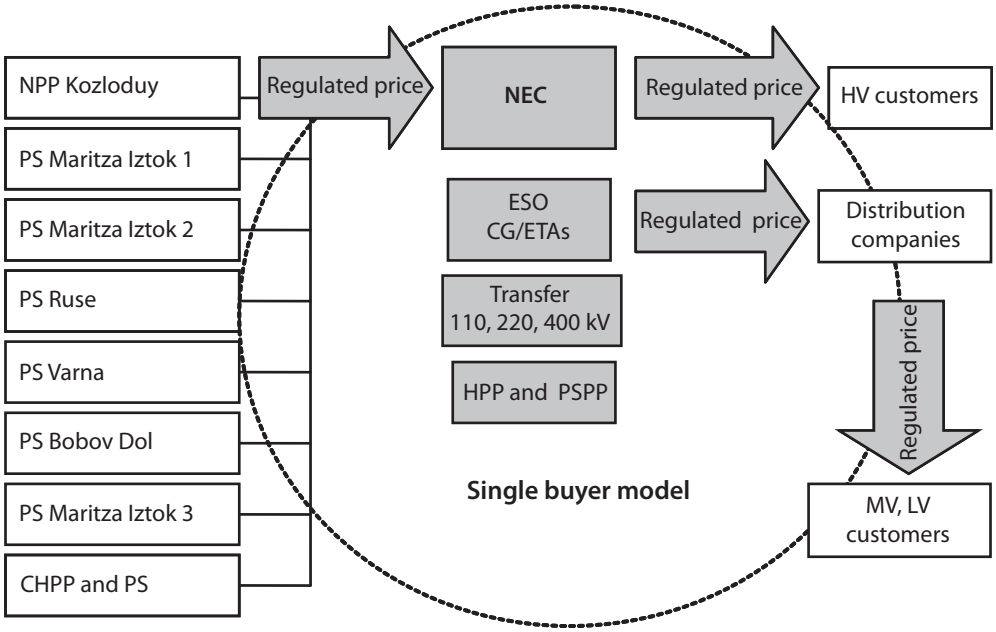

Fig. 1. The single buyer model

The free market in Bulgaria operates on the basis of bilateral agreements between the participants – producers, traders and consumers [3]. The model provides for the plant a possibility to sell both at freely negotiated prices to eligible customers and at regulated prices to the Public Provider – NEC. Currently all companies consuming high voltage (HV) electricity have the status of privileged users and can choose their own supplier. According to the Rules for Electricity Trading [7] and Rules for Access to the Electricity Transmission Grid [8], they must meet the conditions required – on obligations, technical means for measuring and reporting electric power consumption in settlement periods.

The bilateral agreements model using freely negotiated prices is presented in *Fig. 2*.

According to the Rules for access, after 2007 all users, regardless of the voltage level should be supplied electric power at freely negotiated prices. At this point in the free market there registered more than 190 participants. They are divided into several groups – plants, HV customers, customers, medium voltage (MV) customers and traders [2]. The number of producers is relatively constant – 6-7 number of plants, while the number of customers and traders grow over time. In the first two years of the existence of the free market – 2004-2005, active participants were mainly plants and the largest representatives of the heavy industry in Bulgaria, the enterprises with annual consumption of electric power amounting to 100-400 GWh. They are characterized by continuous operation, continuous cycle of electricity consumption regardless of tariffs – peak, day, night. These enterprises possess resources – material and technical resources as well as trained personnel, who can meet the requirements for registration in the market, i.e. provide access to the network granted by the Electricity System Operator (ESO), perform hourly measurement of electricity, preparation of weekly load profiles, analysis and management of the imbalances.

Let's compare the prices of the network services in the regulated and free electricity market. Network services are provided by distribution companies (EDCs) and include: electricity supply and distribution of electricity. The sum of the values of the two components form the tax base on which the Value Added Tax is charged at the rate of 20 %. The total transaction value is the sum of the tax base and the amount of the tax charged.

By the decision of the Regulator of 01.07.2012 the price for supply for domestic customers is determined by the rates (day and night), depending on the type of tariff that the customer has chosen. For example, for household customers there available single- or double-tariff, i.e. day and night tariff. The price for supply includes the so-called "duty". It is a type of tax the amount of which is specified by the Law on Excise Duties and Tax Warehouses [6]. It is calculated based on the total EP consumed by the customer for the period multiplied by the excise rate. For households it is equal to zero and as concerns non-household consumers, it is paid by distribution companies to the State Agency "Customs".

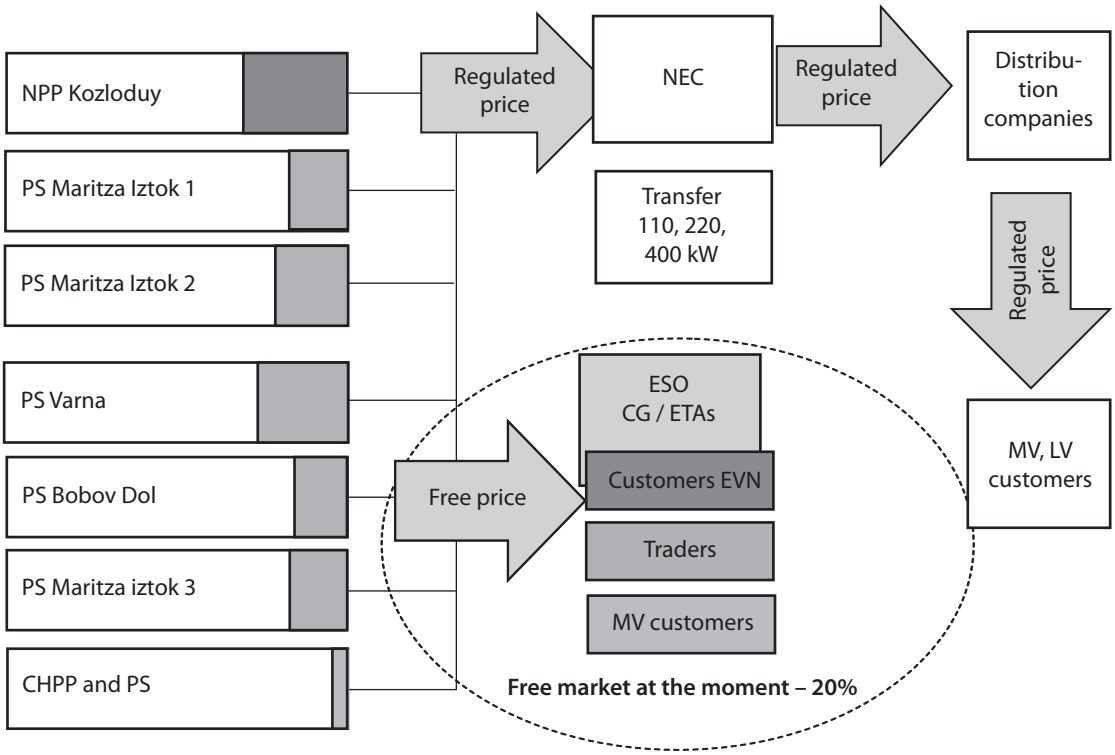

Fig. 2. The bilateral agreements model using freely negotiated prices

The price for electric power is based on the prices for access to the distribution network, access to grid electricity transmission through the distribution network, transmission of electricity through the grid; additional charge for green energy and high-efficiency cogeneration; non-refundable costs (*Fig. 3*):

- Price for access to the distribution network is the price for the service allowing the use of the distribution network. It is calculated as follows:

$$P_{AN} = P_A \cdot Q_E, \quad (1)$$

where P_{AN} – price for access to the distribution network;
P_A – price for access;
Q_E – total quantity of the electric power consumed.

- Price for access to the grid is the price paid by all customers and is charged on the amount of the electric power consumed. It is transferred by the electricity companies to Electricity System Operator (ESO);

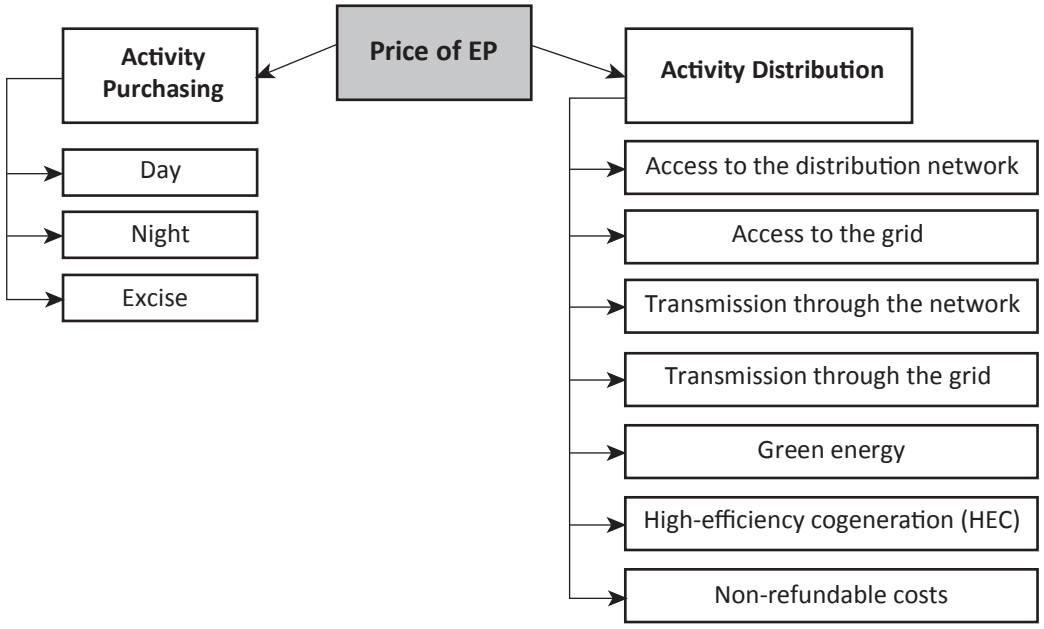

Fig. 3. Formation of the price for electric power

Source: data source (www.cez.bg) [10].

- Price for transmission through the distribution network is paid by all customers and is charged on the amount of the electric power consumed. The price varies depending on the voltage level to which the customers are connected (medium or low) and includes the cost of reconstruction, modernization and maintenance of the network;
- Price for transmission through the grid is paid by all customers and charged on the amount of the electric power consumed. It is transferred for the electricity of the National Electricity Company (NEC);
- Additional charge "Green energy" is paid by all customers and charged on the amount of the electric power consumed. By this additional charge there offset the price "Obligations to society" for the purchase of electric power from renewable energy sources at preferential prices. The charge is paid by distribution companies to NEC;
- Price "High-efficiency cogeneration" (HEC) is paid by all customers and charged on the amount of the electric power consumed. It reflects the costs that are incurred to promote high-efficiency cogeneration of heat and electricity in accordance with European Directive 2004/08/EC. This price is paid by distribution companies to NEC;
- "Non-refundable costs" reflect the price set by NEC for purchasing EP under long-term contracts under Article 35 of the Energy Law [5]. It is paid by the distribution companies to NEC.

In the process of liberalization of the energy market, consumers at regulated prices (households and small companies consuming low voltage electricity) will share the costs for balancing the electricity system of Bulgaria. Thus on the invoices for consumed electric power, there have already been added two more items: "Balancing the energy supply system" and "Balancing the energy distribution system".

This change followed the launch of the balancing market in the country on June 1 2014, according to which the already regulated companies are obliged to make hourly forecasts of electricity consumption by their customers every day. The estimates are submitted to the ESO that manages the electricity system.

When there are differences between the estimates and actual consumption, this creates an imbalance, which is to be shared by all users of the system. These costs are to be paid to ESO, and not to distribution and supply companies. ESO monitors whether there are differences in the forecasts, what is their size and cost. The principle of calculating the cost of balancing for end customers is as follows: the total amount of the ESO's monthly imbalance is divided by the total consumption of all customers for this month. This results in a price imbalance per kW/h, which is multiplied by consumption of each customer.

The maximum size of deviations from the estimates may be included in the final price for electric power and is determined by the State Energy and Water Regulatory Commission – SEWRC. It admits only part of the costs for companies to balance the system; they have the right to include it in the price for electric power. These are up to 1.5% of the deviation in the forecasts of supply and to 0.5% of the deviation in the forecast of distribution. Other unrecognized costs are to be borne by businesses. At the same time, distribution companies and end suppliers will pay the entire cost to ESO for causing the imbalance. Costs of balancing will be updated at least twice within a price period allowed by the Regulator's limits.

According to Decision of SEWRC № C-25 / 29.07.2013 [9], all clients in the free market for electric power in Bulgaria, excluding the clients of the Provider of Last Resort (DPI) are required to pay the price "Obligations to society". It is paid based on the actual recorded EP consumed. The price indicated by SEWRC is 16.37 lev / MWh without VAT and is valid for the regulatory period from 01.08.2013 until 07.31.2014. The introduction of the price element "Obligations to society" on the customer's invoice is pursuant to Article 100, paragraph 4 of the Energy Act and Article 31, paragraph 3 of the Rules for Electricity Trading [7]. In September 2014 customers saw this price on their invoices for the first time. After this change, however, it is important for customers to know that they will not pay network fees for green power, high-efficiency cogeneration (HEC) and non-refundable costs to their network operator.

Tbl. 1 is a comparative table of the approved prices for network services in the free market and export of electricity for the period of 2012-2013 and the new prices for the period of 2013–2014. In *Tbl. 2* the way to form the price element "Obligations to society" is presented.

By 2013 the shares of each energy source in the total amount of EP sold by the Public Provider NEC to distribution companies as end supplier included:

1. NPP "Kozloduy" – 37.08%.
2. Condensing power plants (TPPs), coal – 28.65%.
3. Combined heating, coal – 5.15%.
4. Combined heating, gas – 7.96%.
5. Wind power – 2.90%.
6. Photovoltaic power plants – 4.29%.
7. Hydroelectric power plants (HPPs) – 13.07% .
8. Renewable biomass – 0.17%.
9. Purchased EP balancing the market – surplus – 0.73%.

Total – 100%.

CONCLUSIONS

Quantities of the EP consumed and the costs to be offset should:

1) be approved by the Regulator for each type of production;

2) be recognized by the Regulator for different energy companies;

3) fall within the regulatory framework.

Furthermore, the Regulator will approve individual quantities and costs for individual persons obliged to buy (end suppliers and NEC), which will be compensated "within income received". The proposal for compensation will be drawn up by NEC as the recipient of the compensation income.

At many levels the restrictions imposed on the quantities and costs are likely to generate new legal complica-

Table 1

Comparative table of the approved prices for the network services

Price category	Measure	Established prices in 2012/2013	New prices in 2013/2014	Change
Price for transmission through the transmission network	lev / MWh	9.47	9.73	**+0.26**
Price for access to the grid	lev / MWh	6.48	2.40	**–4.08**
Additional charge "Green energy"	lev / MWh	11.10	–	–
Additional chargeHEC	lev / MWh	3.83	–	–
Non–refundable costs	lev / MWh	3.38	–	–
Price "Obligations to society"	lev / MWh	–	15.20	–
Total cost of network services for the free market	lev / MWh	**34.26**	**27.33**	**–6.93**

Source: data source SEWRC [9].

Table 2

Obligations to society

Price formation for public service obligations	Indicators
Costs of compensation on mandatory purchase of energy for customers in the free market in thousand leva	75 719
Energy intended to be sold in the domestic free market MWh	4 980 000
Price "Obligations to society" in lev / MWh	**15.20**

Source: data source SEWRC [9].

tions and financial tension between supplier companies and their buyers.

Assuming that there is another scheme active:

- a person is obliged to buy the entire quantity at preferential prices regardless of the type and the point of connection of the producers;
- the person is collecting revenue calculated using the final prices set by the Regulator's mechanism to be able to fulfill the obligations;
- the quantities purchased are easily verifiable – they are measured by electricity metering devices;
- the cost of purchase is easily verifiable – it is determined by the Regulator's prices multiplied by the corresponding quantities;
- after the completion of each reported period it may be necessary to adjust the revenue for deviations between forecasts and reports on quantities of the purchased electric power and its cost, which should be reflected in the revenue provided for the same purpose for next year.

After the ten year process of liberalization of the electricity market it is necessary to promote the ideas to solve challenges in the sector. ■

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