

# CONSIDERATIONS ON THE EVOLUTION OF COMPETITIVE ELECTRICITY MARKET IN ROMANIA

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**REZUMAT.** Eforturile pentru integrarea pieței de energie electrică din România în piața europeană de energie electrică unică au provocat transformări profunde ale pieței de energie electrică din țara noastră. Piața de energie electrică este compusă din piața reglementată și piața concurențială, iar tranzacțiile cu energie se fac angro sau cu amănuntul. În lucrare se prezintă, într-o manieră sintetică, componentele pieței concurențiale de energie electrică și principalii indicatori pentru aprecierea nivelului de eficiență, concurență și transparență pe piață.

**Cuvinte cheie:** piața concurențială de energie electrică, indicatori de concentrare a pieței, preț piață, cotă de piață.

**ABSTRACT.** The efforts for integrating the Romanian electricity market in the European single electricity market have caused a deep transformation of the electricity market in our country. Electricity market consists of the regulated market and the competitive market and energy transactions are wholesale or retail. The paper presents in a synthetic manner, components of the competitive market for electricity and the main indicators for assessing the level of efficiency, competition and market transparency.

**Keywords:** competitive electricity market, market concentration indices, market price, market share.

## 1. INTRODUCTION

The electricity market has expanded and improved by introducing in 2005 year the following new market types equipped with rules and proprietary trading platforms:

- Centralized Market for Bilateral Contracts (CMBC);
- Day Ahead Market (DAM);
- Balancing Market (BM);
- Ancillary Services Market (ASM);
- Market Allocation of Interconnection Capacity (MAIC);
- Intra-Day Market (IDM);
- Market for Green Certificates (MGC).

On the Romanian electricity market energy transactions between market participants take place on two market types:

- *the regulated market*, which operates under covered contracts. For this regulated segment of the electricity market, the concentration indicators are not relevant, due to the lack of competition between participants;
- *the competitive market*, which operates by supply and demand.

The wholesale electricity market includes all the transaction of the market participants, with the exception of the final electricity consumers.

The amount of electricity traded on the wholesale electricity market exceeds the amount that is physically transmitted on the generation-consumption chain because the totality of the transactions include the participants' re-selling of electricity with a view to adjusting their contracting position and obtaining financial benefits.

About 47% of the total producers' sales were made on the regulated market and 53% on the competitive market (the calculation does not include the transactions made on the balancing/imbalance market).

## 2. THE COMPETITIVE ELECTRICITY MARKET

On the competitive market, price develops freely, based on supply and demand. The competitive market contains all the transactions concluded on bilateral negotiated contracts (including successive re-sales), as well as transactions closed on centralized markets (CMBC, CMBC-CT, DAM, MGC) which operates through mechanisms such tender.

**The Centralized Market of Bilateral Contracts (CMBC)** works as a market where players may propose contracts containing own delivery graphs, delivery periods (more than a month), hourly power levels, contractual conditions etc.

The players could propose sale offers at minimal price or buy offers at maximum price.

They are published on SC OPCOM SA web page together with the contract the initiator proposed, at least 5 work days before tender date, waiting for the answer offers; if they exist, they are declared as winners as a result of an open tender at the highest price (for a sale offer) or at the lowest price (for a buy offer). As a result of offer assignment, the participants sign the contract the initiator proposed, and this will be followed by releasing the financial guarantee for joining the tender (that should be put in favour of SC OPCOM SA by all participants at the same time with the offer, in order to valid it).

After the closing of the auction session, the Market Operator publishes the list of market participants who have participated in the auction with responding offers; the traded volumes, opening price, the closing price for the offers, and the delivery period.

On the **Centralized Market for Bilateral Contracts with Continuous Trading (CMBC-CT)** offers include the following standard elements: the offered power for each hour during the delivery period 1 MW for base load/ for peak load/ for off-peak load; for a delivery period of 1 week, 1 month, 1 quarter, 1 year.

Market participants who answer the initial offer could offer the quantities they want (number of 1 MW contracts), and the offered prices could be lower, equal or higher than the initial offer, and could be adjusted during the pre-auction stage; during the open auction stage the price of a transaction is established at the level of each answer offer, if it accomplishes the price condition of the initial offer, ordered by the best price.

In case that some quantities remain un-transactioned after the first session, a second session follows, when, during the pre-auction stage, only the initial offer could modify the requested limit price, in order to facilitate the transaction. At the beginning of the second stage of open auction, the transactions are established at the level of the price in the system of the counteroffers, if they correspond to the new price condition of the initiator. After that, by successive modifications of the price asked for by the initiator, respectively of the prices proposed by the counter-offers, transactions are continuously established, up to the end of the session.

The electronic development and the anonymous character of the players during the auctions are the characteristics of this market. The information published in case of this market are: the name of the initiator, the product, the number of the offered contracts, the starting price, the date of the auction, the name of the players who entered the auction, as well as

the transactioned quantities and the related prices, without mentioning the name of the winners.

The transactions concluded on CMBC-CT represented only about 0,3% from those concluded on CMBC.

**The Day Ahead Market (DAM)** is a part of the electricity wholesale market where active electricity is traded for each trading interval of the corresponding delivery day. The Day Ahead Market provides a functional tool in order to archive the equilibrium between the bilateral contracts, load forecast and technical availability of the production units for the delivery day on hourly basis. The active electricity surplus or the deficit can be managed through selling or buying that on the DAM. The market share represented by DAM transactions was in constant growth since the launch of the new arrangements in July 2005 (table 1). In table 2 there are presented the market share, the traded energy volume and the average price on CMBC.

Table 1

The market share for the Day Ahead Market

The year	The market share [%]	Traded energy volume on DAM [GWh]	Average price [Euro/MWh]
2005 (after July1)	6,72	1717,891	34,94
2006	7,88	4105,930	44,78
2007	9,40	5043,193	47,89
2008	9,56	5207,615	51,21
2009	12,64	6346,567	34,29
2010	16,56	8696,190	36,44

Table 2

The market share for the Centralized Market of Bilateral Contracts

The year	The market share [%]	Traded energy volume on CMBC [GWh]	Average price [Euro/MWh]
2006	2,41	1254,578	36,73
2007	12,13	6507,638	49,67
2008	15,81	8612,019	47,44
2009	22,60	11320,968	45,50
2010	7,78	4088,250	38,96

**Green Certificate (GC)** represents a form of support for electricity produced from renewable energy sources. The Producers receive for each unit of electricity delivered into the network, (1 MWh), a number of Green Certificates, according to the provisions of the law. Those Green Certificates can be sold separately from the electricity which produced them, on **the Green Certificates Market (GCM)**.

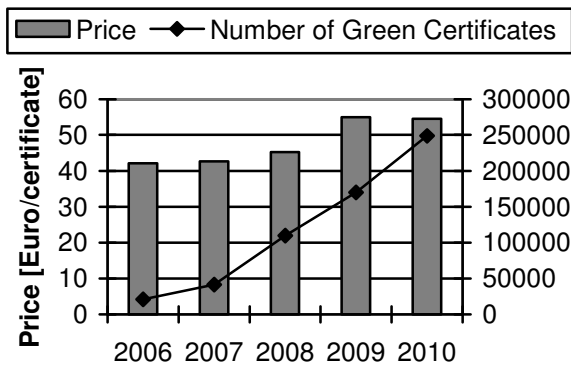


Fig. 1. Price evolution and the number of certificates traded on the Green Certificates Market.

In figure 1 there are presented the price developments and the number of certificates traded on GCM. There is an increase tendency of both the price and the number of certificates traded.

The increase of the transactions volume on the competitive market can be considered as a positive development for the electricity market. The transparency of the price development can also be a reference for contracts concluded through direct negotiation.

### 3. INDICATORS FOR ASSESSING THE MARKET COMPETITION LEVEL

The competitive level in the electricity market can be assessed by a set of transparent and relevant indicators:

- a) rate of market concentration;
- b) the Herfindahl-Hirschman Indicator (HHI);
- c) Pivotal Supplier Index (PSI) or Residual Supplier Index (RSI).

The market concentration is determined by the number of existing market participants and their market shares. **The Rate of market concentration** is reflected in the market share of the largest market participant ( $C_1$ ) or the sum of the market shares of the first three participants ( $C_3$ ). According to practices and documents elaborated at EU level, values of  $C_1$  can be interpreted as:

- values higher than 20% may be concern for competition;
- a value higher than 40% may suggest the existence of a dominant position;
- a value higher than 50% indicates a dominant market position.

Values  $C_3$  can be interpreted as:

- $C_3$  tends to 0%, perfect competition;
- $40\% < C_3 < 70\%$ , moderately concentrated market;
- $70\% < C_3 < 100\%$ , excessively concentrated market.

For each market, HHI is calculated by summing the squares of participants' market shares:

$$HHI(i) = \sum_{j=i}^N [Q_j(i)]^2 \quad (1)$$

where  $Q_j(i)$  is the market share of the  $j$  participant, in the  $i$  time period.

HHI is interpreted as:

- HHI tends to 0, perfect competition;
- $HHI < 1000$ , unconcentrated market;
- $1000 < HHI < 1800$ , moderately concentrated market;
- $HHI > 1800$ , high market concentration;
- $HHI = 10000$ , monopoly.

PSI at system level is defined for each producer/market participant, with the formula:

$$r_j(i) = \frac{CAP_{tot}(i) - CAP_j(i)}{CERERE(i)} \quad (2)$$

where:

$CAP_{tot}(i)$  – total capacity available in the system in hour  $i$ ;

$CAP_j(i)$  – available power of producer/market participant  $j$  in hour  $i$ ;

$CERERE(i)$  – total system load in time interval  $i$ .

RSI is a form of PSI, calculated for the largest producer (seller) of each period.

To customize different markets, PSI/RSI can be determined based on the quantities offered/sold hourly by market participants, according to the formula:

$$r_j / RSI_j(i) = \frac{\sum_{k=1}^N Q_k(i) - Q_j(i)}{\sum_{k=1}^N V_k(i)} \quad (3)$$

where:

$Q_{kj}(i)$  – quantity offered by the producer/ participant  $k/j$  to market in hour  $i$ ;

$V_k(i)$  – quantity sold by the producer/participant  $k$  to market in hour  $i$ .

For determining the market concentration on the markets that he administers, the market operator follows the indicators in table 3.

The indicators for the efficiency/performance of the market (table 4) have the role of appreciating the effects of competition on the market, reflected mainly on the resulted price levels, the change degree of the providers by the end-users and the participants' costs. It is expected that prices will go lower under the influence of competition if all the other elements of influence remain unchanged.

Table 3

Indicators for the concentration/structure of the market

	Indicator	Processing interval	Value type
1.	The share on DAM of every participant (buy/sell, offer/transaction)	monthly	hourly/daily/monthly
2.	HHI on DAM (buy/sell, offer/transaction)	monthly	hourly/daily/monthly
3.	C <sub>1</sub> , C <sub>3</sub> on DAM (buy/sell, offer/transaction)	monthly	hourly/daily/monthly
4.	The share on CMBC of every participant (buy/sell, offer/transaction)*	monthly/yearly	monthly/yearly
5.	HHI on CMBC (buy/sell, offer/transaction)*	monthly/yearly	monthly/yearly
6.	C <sub>1</sub> , C <sub>3</sub> on CMBC (buy/sell, offer/transaction)*	monthly/yearly	monthly/yearly

\* indicators are determined based on the values that are corresponding to the delivery period

Table 4

Indicators for the efficiency/performance of the market

	Indicator	Processing interval	Value type
1.	Prices on DAM	hourly/daily/monthly	hourly/daily average/monthly average
2.	Volume offered/transactioned on DAM	hourly/daily/monthly	hourly/daily average/monthly average
3.	The correlation degree between MCP and the transactioned volume on DAM	monthly/yearly	hourly/daily average/monthly average
4.	The correlation degree between MCP and the internal consumption	monthly/yearly	hourly/daily average/monthly average
5.	MCP volatility	monthly/yearly	hourly
6.	DAM resilience	monthly	hourly
7.	Prices on concluded contracts on CMBC	monthly	monthly average
8.	Quantities offered/transactioned on concluded contracts on CMBC	monthly/yearly	monthly
9.	The correlation degree between CMBC prices and transactioned volumes on CMBC	monthly/yearly	monthly
10.	Price volatility on CMBC	monthly/yearly	monthly

Resilience is defined as the sensitivity of the closing price on the rise of demand, being a liquidity measure on the market.

The indicators for assessing the behaviour of the market participants are referring to:

- the evolution of the offering mode of every market participant that may aim the restriction of

- the real market-selling offer and respectively, hindering someone to enter the market;
- the unplanned unavailability cases of the dispatcherable production units;
- the changes that occurred in the working hours of the dispatcherable production units;
- the available capacity for balancing every dispatcherable production unit;
- the final notifications of priority production;
- the notifications when the units are unbalanced;
- the frequent mistakes in the elaboration of the offers/notifications.

In figures 2 and 3 it is presented the evolution of the concentration indexes on DAM for year 2011. The C<sub>3</sub> indicator has values between 30,8%-37,9% for sales and 34,5%-58,4% for purchases, values that correspond to a moderately concentrated market. The HHI indicator has values between 595 - 1108 for sales and 624 - 1279 for purchases, the majority of the values correspond to a non-concentrated market.

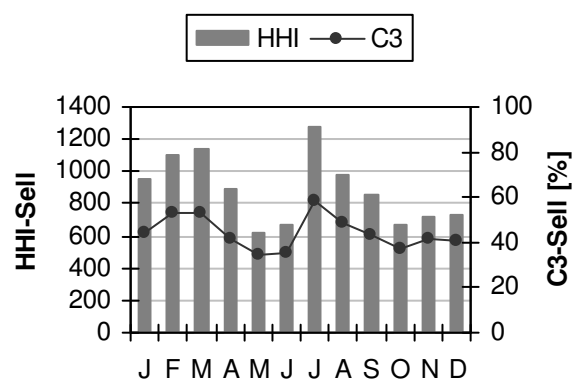


Fig. 2. The evolution of the concentration indexes on DAM (Sell - year 2011).

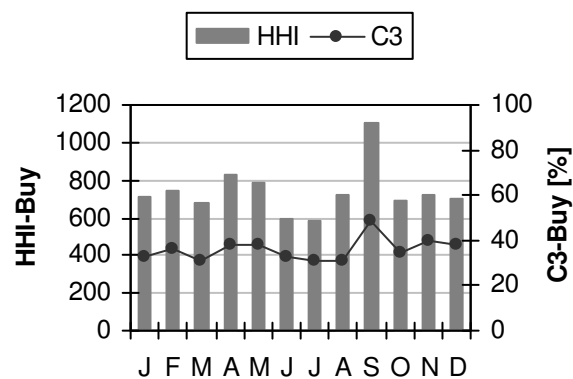


Fig. 3. The evolution of the concentration indexes on DAM (Buy - year 2011).

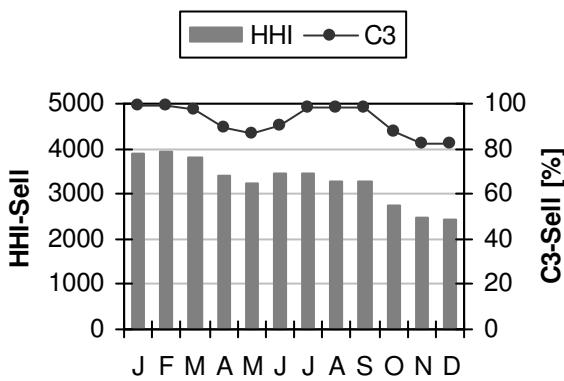


Fig. 4. The evolution of the concentration indexes on CMBC (Sell - year 2011).

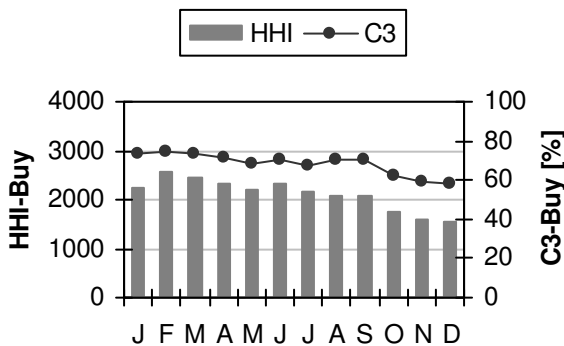


Fig. 5. The evolution of the concentration indexes on CMBC (Buy - year 2011).

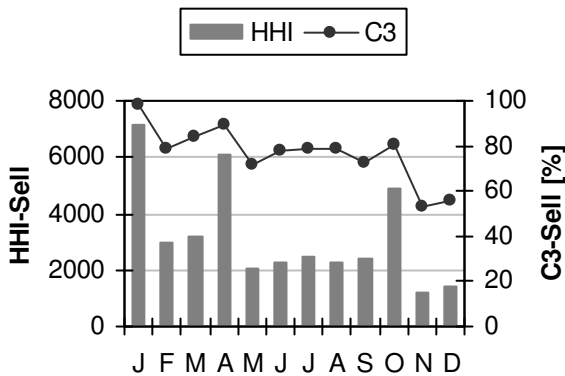


Fig. 6. The evolution of the concentration indexes on GCM (Sell - year 2011).

In figures 4 and 5 it is presented the evolution of the concentration indexes on CMBC for year 2011. The C3 indicator has values between 81,95% - 99,27% for sales and 62,44%-74,89% for purchases, values that correspond to an excessively concentrated market. The HHI indicator has values between 2454 - 3936 for sales and 1569-2552 for purchases, the majority of the values correspond to a highly concentrated market.

In figures 6 and 7 it is presented the evolution of the concentration indexes on GCM for year 2011. The C3 indicator has values between 53,10%-98,48% for sales and 27,36%-89,43% for purchases, the majority of the values correspond to an excessively concentrated market. The HHI indicator has values between 1182-7136 for sales and 726-4770 for purchases, the majority of the values correspond to a highly concentrated market.

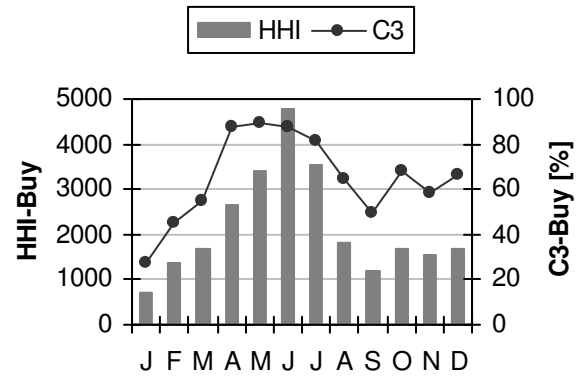


Fig. 7. The evolution of the concentration indexes on GCM (Buy - year 2011).

The evolution of the concentration indexes on DAM and CMBC is presented in tables 5 and 6.

Table 5

The evolution of the concentration indexes on DAM

Year	Sell		Buy	
	HHI	C3 [%]	HHI	C3 [%]
2006	562	30,54	902	42,92
2007	448	26,61	497	28,86
2008	573	32,28	592	32,33
2009	558	29,08	612	34,88
2010	838	42,41	461	25,45
2011	746	35,33	890	44,97

Table 6

The evolution of the concentration indexes on CMBC

Year	Sell		Buy	
	HHI	C3 [%]	HHI	C3 [%]
2006	2657	82,77	1085	46,58
2007	2669	87,55	635	32,52
2008	3142	95,32	551	25,00
2009	4049	98,28	1929	66,58
2010	4048	98,80	2660	76,87
2011	3279	92,43	2109	68,26

In figure 8 there are presented the average annual indicator values of C1 and HHI that are calculated based on the quantity of energy delivered on the network by the producers with dispatchable units.

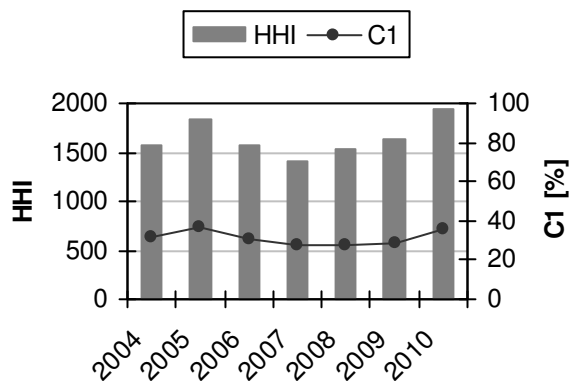


Fig. 8. The evolution of the concentration indexes for producers who dispatchable units

The C1 indicator has values between 28% and 37%, values that can be interpreted as a concern for competition. The HHI indicator has values between 1404 and 1947 which correspond to a moderately concentrated market.

In 2010, the number of producers that owned, as maximum net capacity, more than 5% of the total capacity was of 5, while the aggregated quota of the installed capacity of the 3 most important producers was of 67.37% (values calculated using the above-mentioned domination principle). Given the use of the domination principle, the number of producers that delivered more than 5% of the net electricity production

was of 6, and the aggregated market quotas of the 3 most important producers was of 65.27%.

## 4. CONCLUSIONS

The current rules of the wholesale electricity market encourages large producers with dispatchable units, that can soon start more capacities and can also quickly upload and download appreciable quantities.

It remark increase volumes traded on centralized markets (predominantly CMBC, but and DAM), which is a positive evolution, which led to increasing transparency of transactions.

The price on DAM contain with enough accuracy the available information regarding the level of resources and the need of electricity. The price on DAM is considered as a reference for the electricity market in Romania.

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