Markets in the Electric Power System – A Precondition for Economically Efficient Transition

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INTRODUCTION

A massive programme of construction of renewable energy sources that would replace fossil fuel-burning power plants is a key factor of the transition in the electric power sector. This primarily means construction of solar power plants (SPPs) and wind power plants (WPPs). The full functionality of a liberalised, single, and interconnected organised market in the EU is an indispensable prerequisite to maximize the effect of construction of these types of energy sources. Because of the importance of the functionality of such a market for attaining the target level of decarbonisation of the sector by 2030, its establishment was one of the five objectives defined in the NECP,[1] the EU's decarbonisation planning document.

It has been more than 20 years since the process of electricity markets liberalisation in European Union (EU) countries through the implementation of the first energy package (1996). Liberalisation of the electricity markets in the EU is based on the introduction of competition into generation and supply and on free access to electric power grids. The final objective of liberalisation is creation of the single EU internal electricity market.

The Western Balkans countries, including Bosnia and Herzegovina (BiH), trapped in their own administrative contexts and burdened with the traumas from their recent past are still going through various forms of transition (economic, democratic, and energy). The Wester Balkan Six (Albania, BiH, Montenegro, Kosovo, North Macedonia, and Serbia) differ both by the positions attained in the European Union accession process and in their political organisation and constitutional structure.

Despite its numerous comparative advantages, BiH lags behind other Western Balkans countries in developing an organised electricity market (exchange). The BiH electric power system (EPS) is exceptionally well connected with the neighbouring systems. For many years, BiH has had balance surpluses and at the same time it has been the largest net exporter of electricity in Southeastern

[1] NECP, National Energy and Climate Plan

Europe (approx. 4 TWh in 2020), and, unlike other Balkan countries, it has a developed functioning balancing market[2] with an annual turnover of around 60 million KM. The standstill in the establishment of an organized market in BiH is caused primarily by the absence of an adequate state-level legal framework that would regulate these matters. Bosnia and Herzegovina is a rare European country without a special law on the electricity market. The very fact that the legislation currently in force was adopted 19 years ago and that it has not undergone any serious modifications indicates a total absence of political will of relevant decision makers to improve the situation in this sector.

According to a report of the Energy Community Secretariat,[3] only BiH failed to make significant progress in establishing an electricity exchange. This situation, i.e., the unfinished process of restructuring of the electricity sector, caused the disappearance of the retail segment of trade and preservation of the exclusivity for three majority state-owned electric power utilities to supply buyers each in its own consumer area. In reality, there is no competition between these three power utilities.

A lack of a functioning organized market in BiH causes the absence of transparent single electricity prices that emerge as an interaction of supply and demand, which also represents a key indicator (price signal) when adopting short- and long-term investment decision which should ensure essential investment into new infrastructure facilities. The *status quo* also greatly impedes entry of new participants into the market, hinders integration of renewable sources (primarily of wind and solar power plants), and completely obstructs any regional integration or coupling with the neighbouring markets.

In the last several years, at the initiative and with the assistance of international institutions, there were several attempts of adoption of new legislation, which should be harmonised with the current EU acquis and which should allow establishment of an organised market. However, all these initiatives ended in failure. The results of recent studies by the World Bank[4] and the Energy Community Secretariat[5] indicate that the establishment of an organized electricity market and its coupling with neighbouring markets (exchanges) is both justified and urgently needed.

The price movement trends for electricity and other energy sources in European markets during 2021 became a leading topic both on the political and on the economic level. The significance of these concerns

[2] A balancing market is a central market for purchase and sale of electricity to balance the electric power system, operated by the Independent System Operator in BiH (NOS BiH), to maintain a continued balance of supply and demand in real time.

[3] Energy Community Secretariat, WB6 Energy Transition Tracker, June 29, 2021.

[4] World Bank Study "Further Developing the Electricity Market in Bosnia and Herzegovina" – November 2021

[5] Energy Community Study „Establishing the institutional set-up for organised day-ahead market in BIH", March 2018, https://www.energy-community.org/regionalinitiatives/WB6/TA.html

has inspired this document's attempt to examine its various aspects and highlight the advantages of establishing an electricity exchange in BiH.

1. WHAT IS AN ELECTRICITY MARKET?

In spite of its particular characteristics, electricity is a good as many others. Although in recent history there were a couple of attempts to treat electricity as a service because of its physical properties, in its 1964 decision, the European Court, in a famous case of Costa v. Italian energy giant ENEL, after the trial ended, determined that electricity was to be considered a good after all.[6]

In simple terms, an electricity exchange represents the place where supply and demand meet and, for it to function, several essential elements need to be secured:

- Sufficient buyers and sufficient sellers – lack of market power on both sides,
- Response of supply and demand to the price,
- Liquidity (easy absorption of entry or exit of any actor and of any transaction without significant changes of the market price),
- Efficiency.

In economic theory, a market is efficient if cheapest producers produce and the produced product is consumed by those most willing to pay and that an appropriate quantity is produced. The market price reflects real costs, while in monopolistic systems, the price is set above marginal costs, which may result in generation of excess profits. An important feature of a monopoly is that it naturally blocks entry of new participants, so competition is prevented and the total social welfare is reduced.

There are two dominant forms of electricity trading:

- Bilateral or Over the Counter trading
- Organised form of trading (market)

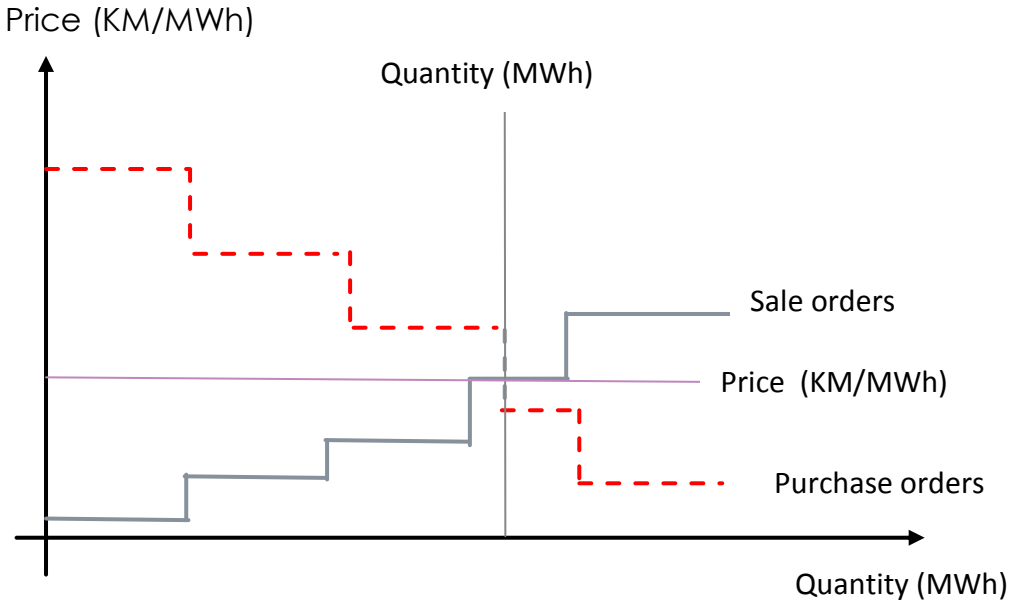
[6] Case 6/64 Flaminio Costa v. ENEL, (1964) ECR 585

1.1 Bilateral trading

Bilateral (two-way, mutual) trading is the oldest and most widespread form of trading in general. In bilateral trading, suppliers and buyers independently arrange electricity transactions with each other in accordance with their own financial circumstances. Economic efficiency is advanced by buyers' selection of the cheapest producers when there is choice available. The bilateral approach offers great freedom for decentralised decision making. It is motivated by the concept of competition in the open market which allows buyers „direct access" to a producer of their own choice. In this form of trading the price is not necessarily public information, which makes this form of trading and of market considerably less transparent and riskier than trading at an exchange, because there is a risk that a party to the contract will fail to meet its obligations if the implementation of the contract has not been insured in an appropriate manner, which comes with a cost.

1.2 Organised form of trading (exchange)

The organised form of trading (exchange) was a more advanced form of trading which offers more options to all participants with a guarantee that all contracted transactions will be completed and paid. A key feature of exchange trading is that it determines a wholesale market price (reference price) which is a result of a transparent and reliable auction mechanism which „matches" supply and demand. The price buyers are willing to pay for the product corresponds to an intersection of supply and demand, as shown in Picture 1.



Picture 1. Principle of formulation of prices in the market.

In general, power exchanges offer a series of benefits and advantages for market participants:

- a reliable reference price (price index) and price signals,
- reduction of risks for all participants,
- considerable greater transparency,
- allowing anonymous, efficient, and simple sale and purchase of electricity,
- as a key participant, they manage congestions in the transmission system,
- allow more efficient integration of renewable electricity sources,
- allow coupling of organised markets and thereby an optimal dispatching of the output.

The fact that electricity is a „good" whose quality does not depend on the supplier makes it particularly suitable for trading in exchanges. An electricity exchange trades primarily in day-ahead and intraday deliveries. Some more advanced exchanges also have a futures market in which deliveries are contracted for a future time at an agreed price.

On an organised Day Ahead Market – DAM, where transactions are agreed every hour, the reference price is established following the rule of the single price by creating supply and demand curves on the basis of all received sale and purchase orders. The intersection of these two curves represents the market price for payment of all contracted transactions (Picture 1). The clearing house, which holds obligatory deposits of all participants as a precondition to participate in trading acts as the guarantor for execution of mutual claims.

On most exchanges it is possible to conclude sale-purchase transaction on the very day of physical delivery, which then becomes Intra-Day Market – IDM. The difference relative to the Day Ahead Market is that in the latter case trading is continuous with transactions being matched automatically, which results in different prices to be paid. In both cases this is a spot market. In intra-day trading, participants can correct their positions (production or consumption) shortly before the delivery (up to 60 minutes). This is particularly important from the standpoint of increased electricity generation from variable RES (vRES), i.e., of supply with a significant share of these sources, because output of these sources cannot always be projected with satisfactory precision. In this manner, the need for a regulatory reserve and for corresponding balancing costs is reduced, permitting economically efficient integration of the vRES.

2 EUROPEAN MARKETS AND THEIR COUPLING

The current single European market emerged as a result of a many-years-long process unfolding within the European Union institutions and in a coordinated manner on national levels of the Member States. Adoption and implementation of numerous EU regulations resulted in creation of national markets and their merger into the Single European Energy Market – SEEM. As a tool for creation of the single market, i.e., for strengthening competition that rested on transparency and reliable prices, the European Commission proposed the so-called Target Model for a Single Day-Ahead Coupling – SDAC and the Single Intra - Day Coupling – SIDAC. This model is based on two broad principles:

1. Development of integrated regional wholesale markets, if possible established on the zonal basis, in which prices provide important signals for producers' operational and investment decisions,

2. The coupling of markets, using the flow-based method of calculation of power/energy in which physical limitations of the grid are based on limitations of critical elements as well as on the so-called distribution power transmission factors. In essence, these factors describe how a change in the net position (imports or exports) of each trading zone alters the energy/power flow in each of critical elements.

Picture 2. Electricity exchanges in Europe

An organised market, including the coupling of markets in accordance with the Target Model, offers a series of benefits, the most important being:

- Economic and technical optimisation of the development and operation of the system,
- Transparent pricing and clear price signals for investors,
- Enhancing reliability (security and flexibility) of the operation of the system, both locally and regionally,
- Stimulus for integration of vRES,
- Prerequisite for conducting auctions for construction of vRES on the basis of the so-called „feed in premium" mechanism,
- Optimisation of the use of resources on the regional level.

Coupling markets optimises allocation and use of cross-border transmission capacities between countries. Because of coordinated calculation of power/energy prices and flows, available capacities are used more efficiently, with the difference in electricity prices between countries or zones narrowing. If there is no congestion on any one cross-border pipeline, the price of electricity would be the same in all zones. Here it is important to note that coupling markets means coupling electricity exchanges.

Before the process of coupling the exchanges throughout Europe commenced, i.e., when they operated in mutual isolation, prior to concluding a trading transaction a market participant needed first to lease a cross-border transmission capacity and only then to purchase electricity on an exchange for transmission across the border. The process of coupling exchanges greatly facilitated trading, because now the market participant only needs to submit the purchase order for electricity through the process of implicit auction (single iteration) while the exchange platform, to reduce the price differential between two exchanges (trading zones), calculates prices by means of the EUPHEMIA[7] algorithm, taking into account and optimising available cross-border transmission capacity.

Numerous analyses confirmed above mentioned advantages of the existence and coupling of electricity exchanges. Consequently, the analysis[8] indicated that just partially coupling the organised markets in the EU yielded benefits of between EUR 1.5 and 2.4 billion per year, while the comprehensive implementation of the Target Model would increase the benefits to EUR 2.5 to 4 billion per year.

[7] EUPHEMIA (acronym for the Pan-European Hybrid Electricity Market Integration Algorithm) represents an optimisation algorythm developed for setting the price of coupled markets for day-ahead trading.

[8] Final Report: "Benefits of an integrated European energy market" prepared for: Directorate-General Energy, European Commission, by Booz & Company, Amsterdam, 2013.

With the recently completed coupling of the markets of Romania and Bulgaria (October 2021), the EU member states in Southeastern Europe have been integrated into the single DAM EU market, i.e., the geographic trading loop encompassing all EU member states has been closed.

At this time there are 15 active organised electricity markets (exchanges) in Europe, as shown in Picture 2. The largest and most liquid European electricity exchanges are the EPEX Spot and NORD POO. Over 1,500 TWh of electricity is traded annually in the European market, and the value of day trading in this market reaches EUR 200 million. A complex computer process of solving the optimisation problem of setting a single price in the EU market by means of the EUPHEMIA algorithm takes 17 minutes.

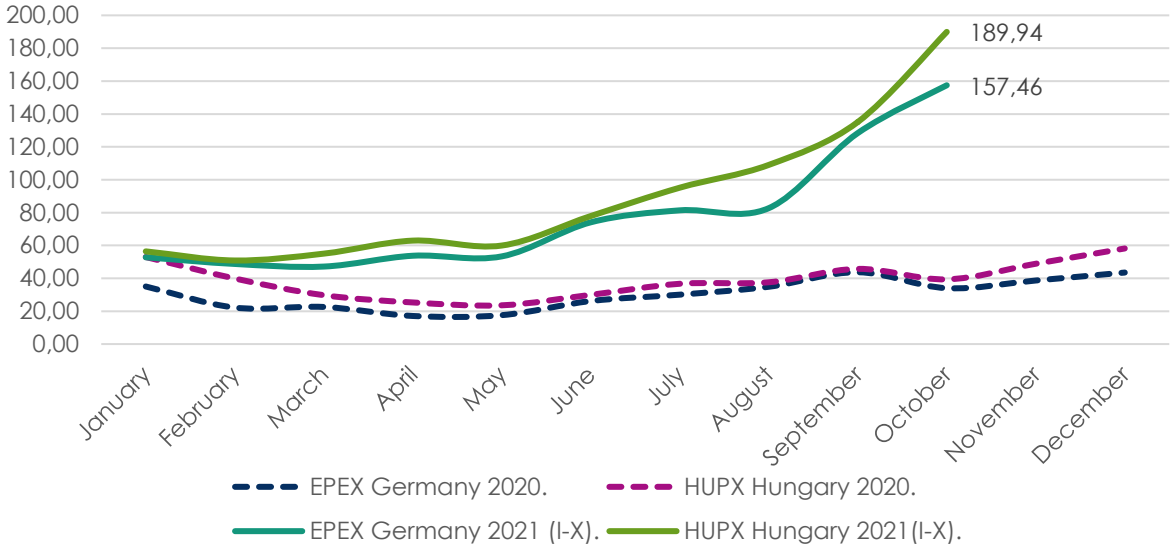
3 ELECTRICITY MARKET IN THE COUNTRIES OF SOUTHEASTERN EUROPE

The production portfolio of the Southeastern Europe (SEE) region is based mainly on conventional energy sources, i.e., hydro, thermal, and nuclear power plants. The average annual consumption of electricity in the region without Turkey is 250 TWh. At 3 TWh, Montenegro's consumption is the smallest, and at 55 TWh, Romania's the greatest. From the standpoint of energy balance, BiH and Bulgaria are greatest exporters, while Croatia, Hungary and Greece are greatest importers

The SEE region has for many years been one of four European regions with a marked electricity deficit. Besides this region, Italy, the Iberian Peninsula (Spain and Portugal) and the U.K. are running deficits. The daily deficit in the SEE fluctuates between 50 and 100 GWh, which means that, on average, this region lacks around 30 TWh of electricity (12% of consumption). The main characteristic of this region was that the markets of the EU member states, while the countries of the Western Balkans that are not EU members, remained isolated from regional trading integrations. The main cause of their isolation was the unfinished and sluggish process of transposition and implementation of EU rules, while in most of these countries the process of establishing exchanges has not yet been completed, or even commenced. All countries in the region with the exception of BiH achieved some progress and are implementing activities to establish national exchanges.

The Hungarian spot market based in Budapest (Hungarian Power Exchange – HUPX) is of special interest, not only for BiH but also for the Western Balkan region. It is at the same time the most liquid spot market in the region of Southeastern Europe, which makes it the reference market. During 2020, a total of 25.23 TWh of electricity was traded in this market at a realized average price of EUR 39/MWh (of baseload electricity). This exchange also encompasses a futures market (Hungarian Derivative Power Exchange – HUDEX), on which

electricity deliveries are contracted for a specified time in the future at a set price. Such an exchange lowers the risk of price fluctuations, determines future prices and, most importantly, shapes the market trends in the region.



Picture 3. Average prices for baseload energy in German and Hungarian exchanges for 2020 and first ten months of 2021 (€/MWh).[9]

As the region runs a regular deficit, i.e., the demand regularly exceeds supply, and as there are congestions on interconnection lines that link the region with Western and Central Europe, the price on this exchange is permanently higher than the price of electricity achieved on the EPEX exchange, which is at the same time the reference European exchange, as shown in Picture 3. The price differential between these two markets in October 2021 was EUR 32.50 for baseload energy. The South East Europe Power Exchange, SEEPEX was created in 2016 and is the sole operational electricity exchange in the Western Balkan region. The Exchange offers day-ahead trading. Although the turnover on this exchange keeps growing, this is still insufficient (2.8 TWh in 2020), and the exchange faces liquidity problems due to the small number of participants and the lack of coupling with the neighboring EU exchanges. Although Serbia borders four EU member states whose markets are interconnected and despite several initiatives for its joining the EU Single Market, the Serbian spot market still operates in isolation because it does not meet formal prerequisites. Among other things, implementation of the Capacity Allocation and Congestion Management - CACM regulation,[10] which defines the process of coupling national markets is an essential prerequisite for coupling to

[9] RESET – own research

[10] Commission Regulation (EU) 2015/1222 of 24 July 2015 on developing guidelines for capacity allocation and congestion management

an EU market. Put simply, to couple two markets, the rules which govern how the markets operate must be the same on both sides of the border. This also relates to the condition that the ETS[11] mechanism is applied on both sides, which Serbia does not meet at this time.

In 2020, Kosovo and Albania signed a memorandum on creation of a joint exchange entitled ALPEX (Albanian Power Exchange) based in Tirana. This exchange is currently in the process of selecting a strategic partner to use a day-ahead platform.

In October 2021, the Montenegrin exchange (MEPX) signed a service contract with the European Electricity Exchange EPEX SPOT and Slovenian BSP SouthPool which would allow creation of the day-ahead electricity market in Montenegro to commence soon.

The Macedonian market operator is also in the process of selecting a strategic partner.

4 ELECTRICITY MARKET IN BiH

Pursuant to valid legislation, the electricity market in BiH is based on bilateral trading. The main feature of the wholesale bilateral trading in BiH is that agreed quantities are reported to the Independent System Operator in BiH so the total volume of trading can be determined exactly, while the agreed price remains unknown and is not published. In fact, it is impossible to establish with precision the financial value (potential) of the electricity market in BiH, except on the basis of estimates and unreliable data, which represents a major shortcoming of this form of trading.

A transparent announcement of the electricity price is important in promoting market competition and for preventing fraudulent behavior in the market.[12] The bilateral form of trading cannot make ensure market coupling with the neighbouring markets and its integration into the EU Single Market because market coupling occurs exclusively through the organised form of trading (exchanges).

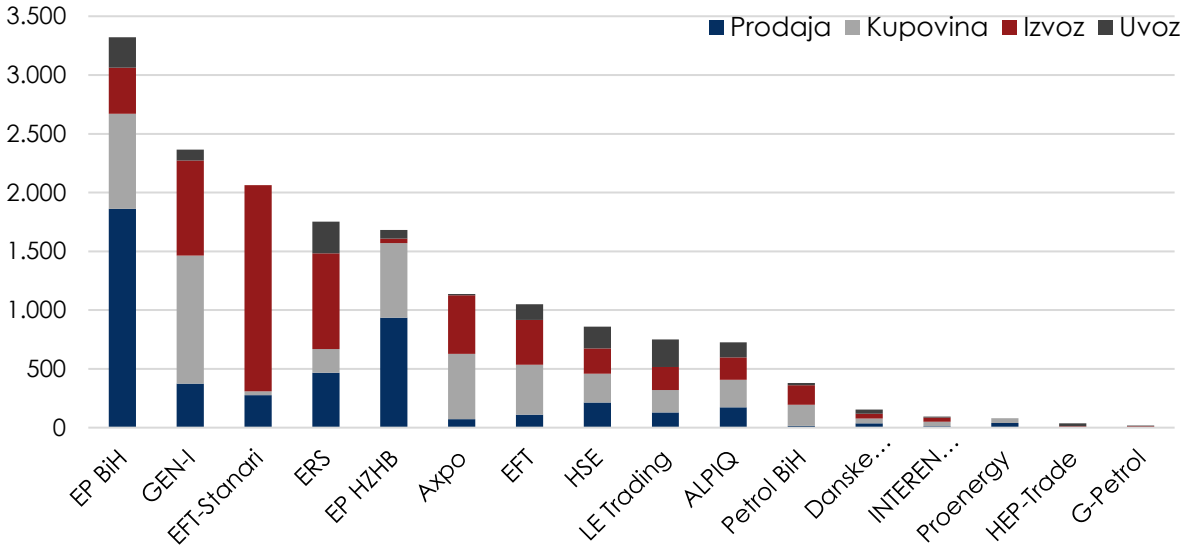
4.1 Wholesale market

Producers, traders, and suppliers are participants in the wholesale electricity market in BiH on condition that they hold appropriate operating licenses that are issued by regulatory commissions in BiH and that they have been registered in accordance with the REMIT rules which were implemented by the State Electricity Regulatory Commission (DERK). According to the publicly available national

[11] ETS – Emissions Trading System: the mechanism for trading in emission units related to carbon dioxide emissions from generation of electricity from fossil fuels. Coupling two markets, one in which electricity is traded on the basis of the ETS mechanism and another in which it is not implemented would lead to unfair competition between electricity producers in the two markets.

[12] Regulation (EU) No. 1227/2011 of the European Parliament and Council of 25 October 2011 on Wholesale Energy Market Integrity and Transparency – REMIT

registry of market participants,[13] at the moment there are 21 participants active in the wholesale market. Most registered traders are typically branch offices of foreign companies registered in BiH for formal reasons, while trading is conducted from their respective headquarters.



Picture 4. Realized trading per market participants in the wholesale market in 2020 (GWh)

Wholesale trading in BiH is for the most part based on balance surpluses of three power utility companies (Elektroprivreda BiH, Elektroprivreda HZHB, and Elektroprivreda RS Mixed Holding Company) that are purchased by traders and for the most part traded in the neighboring markets. In 2020, the wholesale market recorded the turnover of 4.7 TWh (twice the level of trading at SEEPEX) without the realized price being announced. Assuming that the prices of bilateral contracts reflected those achieved in the regional markets (e.g., HUPX), the financial result generated on the wholesale market in BiH during 2020 is estimated at nearly EUR 183.3 million.

The largest electricity sales in the internal wholesale market in 2020 were realized by three power utilities (3.26 TWh), while the GEN-I Company was dominant on the purchasing side (1.1 TWh). An overview of trading realized by market participant is shown in Picture 4.

In 2020, market participants realized 5.5 TWh of electricity exports, with the bulk (78%) exported by electricity traders and independent producers, while the remaining 22% was directly exported by three power utilities, mainly through bilateral agreements. The share of the independent producer EFT Stanari Mine and Thermal Power Plant was also significant, with the

[13] www.derk.ba/remit/registar

annual sales of nearly 1.8 TWh. Electricity imports in 2020 totaled 1.5 TWh and were considerably lower relative to previous years.

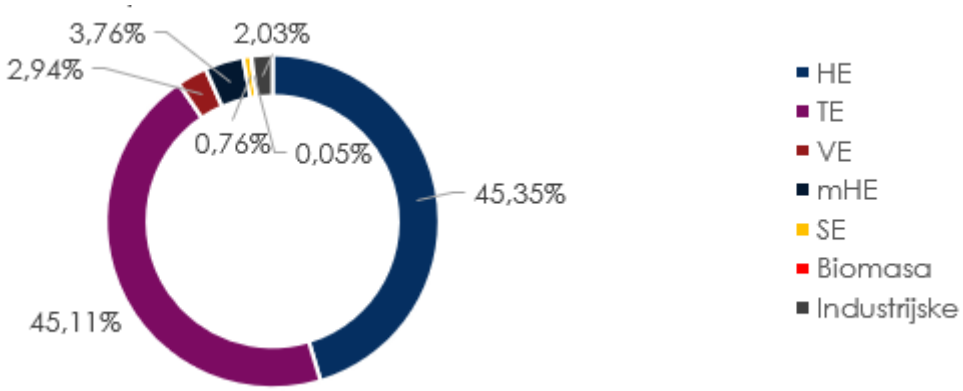
Above data on quantities of exported electricity and on its value may seem very attractive from the standpoint of economic benefits from exports. However, attention must be paid to the fact that BiH will either introduce a system of trading in CO_2 certificates or, most probably starting in 2026, electricity exports to the EU will be „taxed" through the introduction of the CBA mechanism. In both cases the cost of producing electricity for exports will rise. The above mentioned report[14] examined the potential impact of the introduction of this cost of EUR 11.70/MWh in 2025 and demonstrated that the production cost would rise by more than EUR 100 million in annual terms.

4.2 Electricity production

In BiH, electricity is predominantly produced in hydro power plants (HPP) and thermal power plants (TPP), which combined account for over 90% of the total installed generation capacities (4.577 MW). Most of these plants had been built between 1955 and 1989, during a period of intensive construction of energy plants. Operation of thermal power plants is based on domestic coals whose energy value is between 8,000 and 12,000 kJ/kg (lignite) and between 14,000 and 17,000 kJ/kg (brown coal).

Electricity production from thermal power plants in BiH has been stable for many years and it fluctuated between 9 and 11 TWh in annual terms. In 2020, TPPs produced 10.4 TWh, i.e., 68% of the total generated power, which was 15.39 TWh in 2020. On the other hand, production in HPPs is variable and depends on hydrologic conditions, and in 2020 it was 4.3 TWh. In several recent years, a trend of construction of plants that use vRES (wind and solar energy) has become evident. The total installed capacity of solar power plants reached 40 MW in 2021. The installed capacity of WPPs (134.6 MW) accounts for less than 3% of the total production capacity. An overview of production capacities in BiH is shown in Picture 5.

[14] The World Bank Study „Further Developing the Electricity Market in Bosnia and Herzegovina, November 2021



Picture 5. Structure of production capacities in BiH.

4.3 Market concentration in the wholesale market

In countries with developed electricity markets, the well-known Herfindahl-Hirschmann Index – HHI, which takes into account the total number of companies in the market and their market share, is used to measure market concentration, to reveal the likelihood of „strong" market participants influencing trading on the organised market. An HHI value below 1,000 indicates low concentration, values between 1,000 and 1,800 medium concentration, and values above 1,800 high market concentration. High concentration is a characteristic of the state when a small number of participants have a large market share. The HHI index is most often calculated on the basis of the total produced electricity, i.e., of the total production capacity.

In 2020, the HHI for the wholesale electricity market in BiH was 2,998, which, relative to reference values, indicates high market concentration. The share of the largest producer in the total output was 40.5%, the share of top two largest producers was 73%, while the share of the top three was 86%. Table 1 shows HHI values for total electricity produced. If the calculation of market concentration were carried out on the basis of available capacities, and if these capacities would be combined with capacities for electricity imports, then the HHI would be around 1,500, which would put it into the category of medium market concentration, which means that the potential influence of „strong" market participants on price movements and overall trading on the exchange would be within acceptable limits.

The RSI (Residual Supply Index) is a market indicator which detects the extent in which a given market participant is essential to ensure that all demand was fully covered. Relative to reference values, a RSI below 1 indicates that a dominant market participant has a potential to determine the market price on his own (if the demand is totally inelastic in the short term). For all hours of electricity deliveries whose RSI value is higher than 1, it would be difficult, if at all possible, for a

dominant market participant to determine the market price on his own even if they wanted to.

Table 1. Market concentration on the wholesale electricity market

Producer	Share in total production %	HHI
Elektroprivreda BiH d.o.o. Sarajevo	40.57	1646.0
Elektroprivreda RS a.d. Trebinje	32.52	1057.4
Stanari Mine and Thermal Power Plant d.o.o	13.02	169.4
Elektroprivreda HZHB d.o.o. Mostar	10.93	119.6
Other producers	2.31	5.3
FL WIND d.o.o. Tomislavgrad	0.65	0.4

Thus, for instance, the calculated RSI indicator value for the Elektroprivreda BiH, using per-hour data for 2020, was 1.57 on average. The HHI conclusions and the RSI analysis were consistent and indicate that the possibility to exploit market power in BiH is limited by the current market structure.[15]

It is clear that extensive trading takes place on the BiH wholesale market, but it is handicapped in the sense that it does not send transparent price signals in the way an institutional market, such as an exchange, does. Above mentioned data on trading quantities and acceptable ratios in terms of utilization of market power reveal a considerable potential for trading in an organised market, an electricity exchange. If the quantities for trading on an exchange are combined with the electricity for covering losses in the transmission and distribution systems, the market's liquidity would be even higher.

4.4 Retail market

The retail market is a trading segment in which contracted electricity is consumed by end-buyers (consumers). The total number of electricity buyers in BiH as of end-2020 was nearly 1.6 million, 90% of whom were in the household category, which accounted for 49% of the total consumption in BiH. Table 2 shows the structure, composition, and the number of electricity buyers in BiH in 2020. Since January 1, 2015, all buyers of electricity are entitled to freely choose suppliers in the market, however, only a negligible number of buyers exercised this right. The reasons are numerous, but primarily reflect the lack of competition

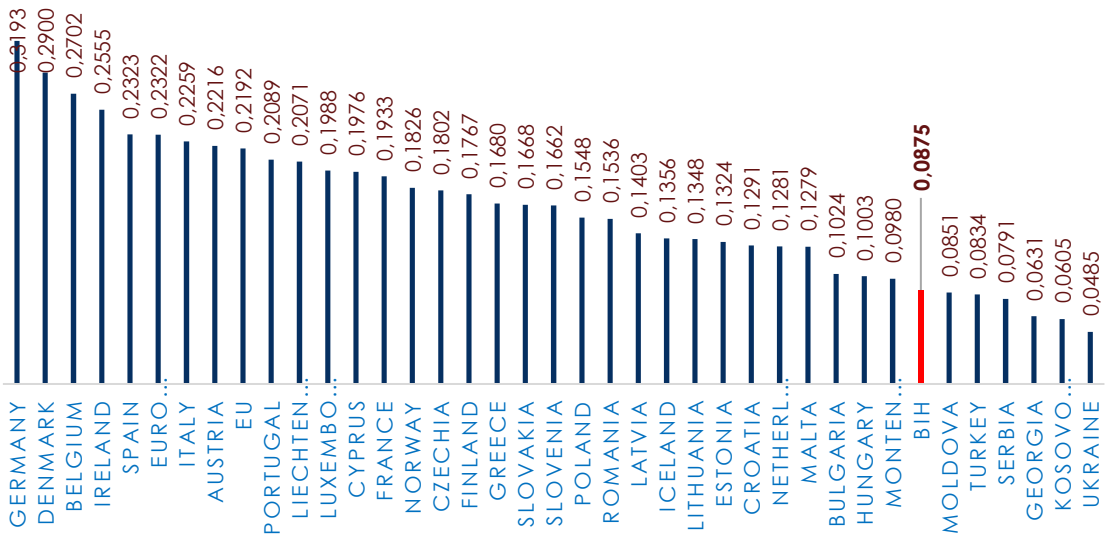
[15] The World Bank Study „Further Developing the Electricity Market in Bosnia and Herzegovina, November 2021

between state-owned power utilities, in the context of cross subsidisation between the categories of „household consumption“ and „other consumption“, and generally of a relatively low electricity price, which is among the lowest in Europe.

With an average price of 39 €/MWh for electricity generated in BiH power plants, which is calculated in the final electricity price for final buyers, it is hard to for any independent producers that could offer a better average price. Pictures 6 and 7 present a comparative overview of electricity prices for households and industrial buyers, by country, in Europe in the first half of 2021.[16]

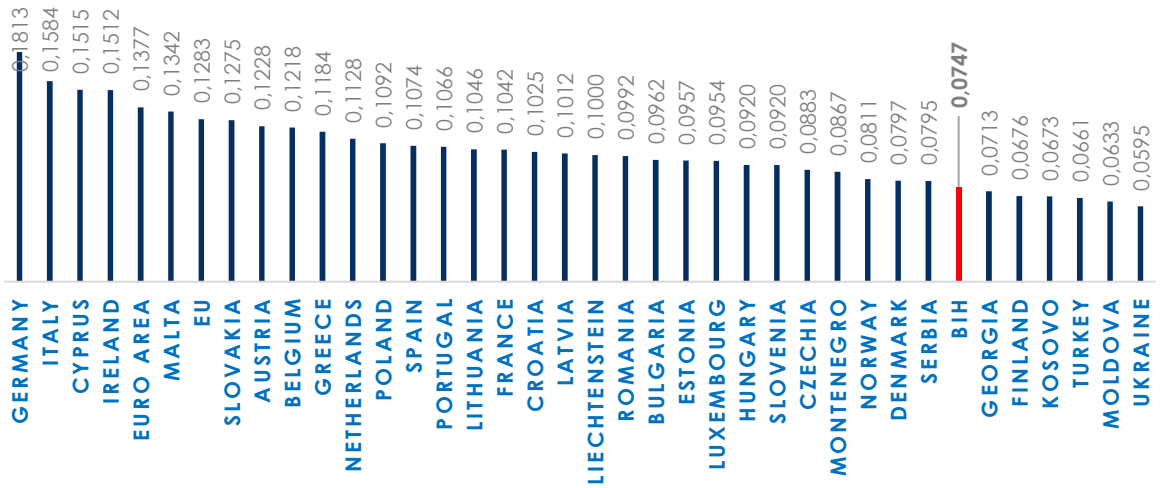
Table 2. Structure, consumption, and the number of buyers of electricity in BiH in 2020

Buyer category	Number of buyers	Consumption (GWh)
110 kV	16	777.3
35 kV	93	387.7
10 kV	2,226	1,896.3
Other consumption	123,991	1,746.1
Households	1,451,144	4,796.8
Street lighting	11,303	182.5
Total	**1,588,773**	**9,786.8**



Picture 6. Electricity prices in €/kWh for households in the first half of 2021, according to Eurostat methodology.

[16] EUROSTAT (European Union's Statistics Office), https://ec.europa.eu/eurostat



Picture 7. Electricity prices in €/kWh for industrial buyers consuming from 500 MWh to 2,000 MWh in the first half of 2021, according to Eurostat methodology.

The household prices shown here include the value added tax (VAT), while the prices shown here for industrial buyers do not include VAT.

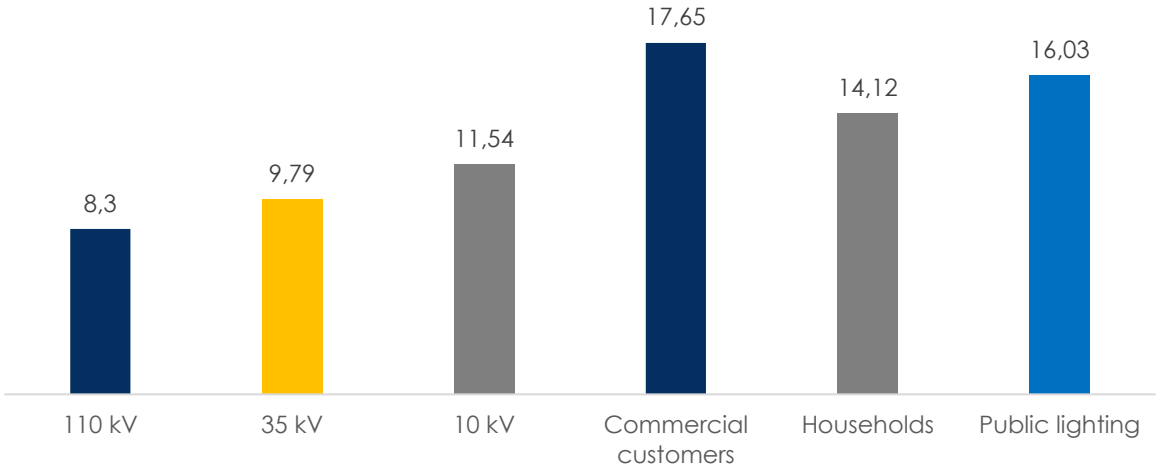
The buyers in these categories exercise the right to be supplied by public suppliers (three power utilities and the Brčko Utility Company) as part of universal service. The right to supply as part of universal service is enjoyed by buyers who receive low-voltage supply (0.4 kV). Other buyers, who receive medium- (10, 20, and 35 kV) and high-voltage (110 kV) electricity are supplied at market prices. Average prices (excluding VAT) in 2020 by consumption category are shown in Picture 8.

During 2020, within universal service, buyers received 65.6% of total consumption at regulated prices, while the buyers for whom prices are not regulated were supplied with 3,427.73 GWh (34.4%).

In 2020, cross-subsidisation between small commercial buyers (other consumption) and households, was 29% on average, recording the lowest value for buyers supplied by the Brčko Utility Company (13.5%), and the greatest for buyers of the Elektroprivreda BiH (30.1%).[17] The presence of cross-subsidisation indicates that prices for these categories do not reflect real costs in price formation.

Abolishing the above mentioned cross subsidies would encourage market competition in the retail segment and permit entry of new suppliers. As an illustration, only three market suppliers were active in the retail market in 2020: HEP Energija d.o.o. Mostar, Petrol BiH Oil Company d.o.o. Sarajevo, and Energy Financing Team d.o.o. Bileća. These suppliers delivered 60.78 GWh to industrial buyers (10 kV) and 1,29 GWh to buyers in the „other consumption" category,

[17] DERK, 2020 Annual Report



Picture 8. Average (retail) electricity prices in BiH 2020 (pfennig/kWh).

which constitutes a negligible (0.54%) of the total (gross) electricity consumption in BiH, which was 11.3 TWh in 2020. On the transmission system, the largest registered sale was recorded by the LE Trading BH d.o.o. Banja Luka, which supplied the B.S.I. d.o.o. Jajce with 103 GWh.

Out of 1.6 million electricity buyers, only 17 changed suppliers in 2020. The value of electricity supplied to all buyers was KM 1.4 billion (this amount excludes VAT).

The above analysis indicates that the retail market has a considerable potential, and yet trading in this segment is minimal. Although there are a few independent traders in the market, because of low electricity prices, primarily for low-voltage buyers, it is almost impossible to offer better prices than the prices offered by three power utilities through universal service supply. In effect, the power utilities are in position to supply buyers from their production mix, which includes a considerable share of electricity generation from hydro power plants, which have extremely low marginal costs. The price in the regional market is however set by the power plant with the largest marginal costs. Consequently, occasional imports into BiH occur only when the generation in wind power plants in the EU is large, when the price in the regional exchange is lower than the marginal costs of some thermal power plants, and when importing electricity is profitable for power utilities.

4.5 Balancing electricity market

Stability and reliability of the electric power system is based on an ongoing continuity of the balance between electricity generation and electricity consumption. To ensure this balance, various products (ancillary services) are used which are procured in the balancing market. This market is the central market for purchasing and selling electricity, and of the products to balance the electric power system

in real time,[18] and has a crucial role both for stable and reliable operation of the electricity system and for successful functioning of energy markets.

The balancing market in BiH, which is administered by the Independent System Operator (Nezavisni operator sistema – NOS BiH) has operated successfully since 2016. The participants in this market include the NOS BiH, which is the only participant on the demand side, while the supply side is populated mostly by producers offering ancillary services (capacity and energy in secondary and tertiary regulation and electricity for covering losses in the transmission system). Prices of ancillary services are formed on market principles and are for the most part procured in the annual invitation for offers published by the NOS BiH.

Each variation (imbalance) by a market participant that occurs as a differential between realised (measured) and balanced quantities must be corrected through a certain mechanism (an ancillary service) to restore the balance to the system. The average price of electricity for covering imbalances was KM 106/MWh in 2020 in case when the participant had a deficit (negative imbalance) and KM 34/MWh in the event an electricity surplus was generated (positive imbalance). The total value of services traded in the balancing market in 2020 was nearly KM 53 million. The bulk of trading realized in this market (70%) was related to electricity purchases for covering losses in the transmission grid. An obligatory procurement of electricity for covering losses proved in many countries to be a product that is successfully obtained in an exchange, thereby contributing to its greater liquidity, which could be significant for establishing an electricity exchange in BiH.

5 SIGNIFICANCE OF ESTABLISHING AN ELECTRICITY EXCHANGE IN BiH

Bosnia and Herzegovina lacks an established organised electricity market, with a notable absence of any significant activities that would lead to its creation. In view of the obsolescence of the current legal framework on the state level, which had been adopted long time ago, in 2002, and of the fact that it has not been harmonised with the current EU acquis in this field, not is it sufficient for establishment of an electricity exchange. By signing the „Sofia Declaration“ in November 2020, BiH adhered to the European Union's Green Transition policy. One of the obligations assumed with this declaration is the adoption and implementation of the Integrated National Energy and Climate Plan (NECP). The regulation[19] governing the preparation of the NECP, as a planning document, encompasses five dimensions of the energy union, with the dimension 4 focusing on defining objectives, policies, and measures for establishment of an

[18] Independent System Operator in BiH, Market Rules, 2021.

[19] Regulation (EU) 2018/1999.

organised electricity market and its coupling with the regional or the EU market. In this declaration, Bosnia and Herzegovina again undertook to create an organised electricity market and, along with its operation, create the preconditions for implementation of the so-called EU Target Model which will allow the integration of the BiH market into the single EU market.

Observing the above mentioned obligations, as well as the dynamic of the establishment of an organised market in BiH is questionable and unpredictable in view of evident delays in the implementation of the EU acquis in this area. The new EU legislation on the introduction of the Carbon Border Adjustment Mechanism – CBAM[20] proposes creation of an adjustment mechanism for imports of energy intensive products from countries that have not introduced a CO_2 taxation system. The CBAM also applies to electricity imports. A condition for a country (including BiH) to be exempted from the application of the CBAM is the implementation of the core provisions of the EU acquis related to the operation of an organised electricity market and market coupling into its national legislation. The deadline for implementation of these regulations is January 1, 2023, which is another deadline for Bosnia and Herzegovina.

Although the new deadline is an important factor for accelerating the process of establishing an organised market, the key reason for its establishment should be the fact that it becomes a mechanism of decarbonisation, as it supports the integration of vRES, which is a basic measure of the electricity sector's green transition. Besides, a developed and coupled organised market is a factor of reliability and supply security of the electric power system, in which solar and wind power plants have an important place.

Besides the above mentioned benefits, establishing and coupling the BiH market with other markets in the region and beyond brings considerable economic benefits. The report prepared for the World Bank demonstrated that the optimisation of the production in BiH based on the operation of an organised market and on the coupling with the neighbouring organised markets would yield a reduction of around KM 120 million per year in production costs, which would be significant, as this is equal to 10% of all electricity production costs in BiH. In fact, trading on an exchange in BiH would permit the optimisation of the dispatching of thermal and hydro power plants on the level of the entire system, unlike the current practice of dispatching within individual power utilities. The study[21] drafted for the Energy Community Secretariat demonstrated the benefits from the operation of an organised and coupled market. The findings of the

[20] D. Miljević, M. Kušljugić, „A Perfect Storm or Accelerated Decarbonisation, Taxing CO2 Emissions in the Power Sector in BiH", RESET Policy Paper, 2021.

[21] Energy Community Study „A Carbon Pricing Design for the Energy Community", January 2021.

study recommended establishing the market, because the option of developing production capacities in the event of a progressive or full introduction of a CO_2 tax ensures lower electricity prices for consumers in BiH in the case an organised market is established and coupled with other markets relative to the fragmented market.

Furthermore, the example of the already successfully established balancing market and the trilateral agreement between Slovenia, Croatia, and BiH on sharing the common tertiary reserve might serve as an indication of potential benefits for the system in BiH and its participants, if an operational organised market was coupled with the markets in the region. This agreement reduced the necessary reserve capacity of BiH from 260 MW to 196 MW, thereby freeing significant capacities for electricity generation and at the same time reducing the costs of the balancing mechanism. This example clearly shows that market concentration produces considerable benefits. The balancing market shows that competition between power utilities in BiH is possible and that it would be profitable, primarily for consumers.

6 CONCLUSIONS AND RECOMMENDATIONS

Bosnia and Herzegovina must take advantage of benefits and opportunities that go along with the establishment of an operational organised electricity market. Balancing electricity surpluses over many years, a strategic transit position in this part of Europe, excellent coupling with the neighbouring systems, the established balancing market, implemented REMIT regulations and, above all else, the complementary production portfolio between the market participants are positive factors for BiH, which should represent drivers for the establishment of an exchange.

Conclusions of relevant studies indicate that establishing an exchange is fully justified and necessary and that it will bring significant benefits to all participants. The establishment of an exchange in BiH should in no way be perceived as the final objective but only as just another iteration in a series of activities that will lead to the integration of the BiH national market into the EU single internal market.

Progress in this field can be achieved by implementing the following set of specific and necessarily connected activities:

- Fast-track the adoption of a new set of state-level laws that will permit the processes of the establishment of an organised form of trading (an exchange),
- Conduct the transposition and implementation of the relevant EU regulations and grid codes that allow the creation of identical conditions and rules for trading as those in force in the EU,
- The establishment of an exchange should be implemented gradually,

starting with the operationalisation of the DAM, as its most significant segment,
- Complete the initiated process of restructuring vertically integrated power utility companies, which would permit decoupling of market and monopolistic activities and encourage competition,
- Finally abolish existing cross-subsidies between consumption categories, which would increase competitiveness in retail trading, while final prices would reflect corresponding real costs more realistically,
- Introduce the ETS mechanism gradually and in harmonisation with the countries in the region.

To successfully implement these measures, Bosnia and Herzegovina must make a significant effort to continue the reform in the sector and improve the existing form of electricity trading and make it more efficient and more transparent, and the sector itself more attractive for investors. Any delays in the establishment of an organised market will result in non-optimised electricity trading (which is the current situation), significantly lower interest of serious investors for building power plants powered by renewable energy sources, inability to couple with other markets in the region, and non-transparency and inefficiency in trading in the wholesale market.

Taking into account the current political situation, the complex administrative procedure, and traditionally slow adoption of new laws, it would be a thankless task to forecast the dynamic and a timeline for adoption of the new legislation that would finally regulate this area. Clearly, Bosnia and Herzegovina faces a very challenging task which will difficult to complete. However, a failure to establish an exchange will make exports to the EU much harder due to the introduction of the CBAM and, even more importantly, delay meeting decarbonisation targets because of sluggish construction of vRES capacities.