

Electric Power Market: Competition in the Conditions of Global Change and Digitalization

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Abstract- The present paper examines the actual problem of changing conditions of competition in the electricity market, considering the peculiarities of its development in the context of global changes and digitalization. This study is aimed at developing approaches to mitigate state and interstate regulation of the development of competitive market conditions through the creation of prerequisites for freer competition. The authors analyze the features of the electricity market based on the special nature of the electromagnetic processes in electrical circuits, obeying objective physical laws, causing the technological features of the process of production, as well as transmission and consumption of electrical energy. It is shown that the features of this market, including the active development of digitalization, have a serious impact on the creation of conditions for freer competition. In order to improve the efficiency of the electricity supply sector, the necessity of re-forming the conditions of competition in the electricity market is justified regarding the use of digitalization as a tool to improve the industry's technological processes.

The materials of the present paper are of practical value for various organizations engaged in business in the field of electricity, the functioning of digital enterprises, government agencies, as well as specialists in the electric power industry. The approaches formulated in the paper can be used in practice in the development and implementation of a new set of measures to develop competitive conditions in the studied market, making management decisions based on digital technology, big data and artificial intelligence.

Keywords- Electric Power Market, Competition, Government Regulation, Development and Reform of the Electric Power Industry, "Deregulation" of the Electric Power Industry, Digitalization.

1. Introduction

In the electric power industries of the industrialized, processes are actively developing, accelerating the development of new competition conditions, serving as a systemic tool for increasing the efficiency of production processes, supply and consumption of electric energy, and increasing equipment reliability through the introduction of digitalization and customer service quality. Due to a grad-

ual transition to freer competitive principles of interaction between suppliers, consumers, and the real and virtual sectors of the economy, the newly emerging subjects of the electricity market (hereinafter - the EER) begin. In the reforming process, there is a gradual replacement of traditional methods of rigid state management and regulation with flexible digital mechanisms of market functioning, i.e. the introduction of a self-regulation system for economic entities. The processes of informatization and digitalization actively develop activities and interaction of people in electric power systems. The relevance of this study is because the characteristics of the electricity market, in addition to economic, political information-digital and other factors, have a considerable impact on the effectiveness of the reform processes in the national economy sectors. However, despite this, no country has yet completed the creation of a satisfactory competitive EER.

2. Materials and Methods

As the main research method, the paper uses a comparison of the characteristics of the electricity market with the properties of modern markets with developed competition. Special properties of the market are considered versus the background of modern ideas about the main characteristics of the markets, including the development of digitalization.

3. Results

3.1. Features of the Electricity Market

Entrepreneurship on EER (as in other spheres of human activity) is competitive since "entrepreneurship is always competitive by nature and by definition" [1]. At EER, as well as in any market, the pronounced competitive nature of the relations of the subjects is expressed as "... that different actors are consciously or unconsciously competing with each other in order to be the first to discover and use the opportunities to extract profits" [1,2]. The nature of the interaction of business entities in the EER is largely determined by the peculiarities of the technological processes of creation, transfor-

mation, transmission, and the consumption of electric energy. The main features of EER include:

- Conditionality of electricity supplied by technological connection between electrical installations of a consumer with a source of generation. Deliveries are due to the electrical connection between the source of generation and the power-consuming device (Based on today's ideas of humanity about this phenomenon and electrical technologies used in the current period). Only after technological connection to a single electrical network for them, it is possible to implement transactions for the actual supply of electricity.

The combination of various sources of generation with a mass of energy-consuming devices of various consumers through electrical networks as part of an EES provides the market entities with a range of technological, economic benefits and advantages [3] and creates prerequisites for the development of competitive conditions in the specified market [4].

- Technologically determined need for concerted actions of EER subjects, aimed at constantly maintaining the overall balance of active (and reactive) electrical power in the EES used by them. The provision of the necessary parameters of the specified technological process is achieved only if the overall balance between the active electrical power taken from the indicated system by various power-consuming devices and the power supplied to the indicated system by the generation sources is maintained.

The technological need for continuous monitoring and regulation of the operating modes of facilities that are part of an EPS to maintain the overall balance of electrical power in an EPS necessitates coordinated and interrelated actions of the subjects.

- Use on EER, along with general economic, specific "sectoral" legal norms and rules (special, not accepted in other human activity areas). The implementation of transactions on the EER occurs due to the joint coordinated activities of various people and their structures, forming together and using the technological capabilities of the EPS. Since the objects of both suppliers and consumers belong to a multitude of economic entities, specific rules and regulations are used that are characterized by the specified market.

- Accompanying the purchase and sale of electricity with a number of related services necessary for the technical support of its supply with the required quality and reliability (continuity) indicators. In modern EER, services are used aimed at

providing the required parameters of electrical energy at the points where consumers' electrical installations connect to the electrical network, including a wide range of special services.

- All goods and services have a certain value for consumers and they must meet the agreed quality requirements [4].
- Formation at the EER of a special system of information exchange and digitalization aimed at maintaining the operating EPS conditions, as well as the timely execution of transactions and commercial mutual settlements of market entities. The system of constant information exchange between suppliers and consumers of electrical energy, assumes the availability of digitized data on the composition, parameters, characteristics and condition of the equipment first in real time, as well as on the quantity and quality of electrical energy.

3.2. Properties of Modern Markets with Developed Competitive Conditions

When considering the development of competition in EER, it is important to consider that the market economy is the product of a long historical process; the evolution of the market economy continues today and it will not stop in the future (The market economy system has never been tested in a complete and clean form. In general, in Western civilization from the middle Ages, the tendency to the abolition of institutions impeding the functioning of a market economy prevailed) [2]. Therefore, the assessments and ideas of people about the properties of markets with acceptable conditions of competition will gradually change in parallel with the development of market relations, themselves. In modern conditions, the main properties of markets with developed, unreformed conditions and mechanisms of competition include the following (The subject can be a subject of special scientific research. Only a very condensed description of it is given here, as part of the presentation of the material of this paper):

- The use of modern market institutions forming the basic conditions for ensuring the independence of suppliers and customers, freedom of enterprise, as well as free exchange of resources and information. The most important institutions characteristic of modern markets with developed competition include the following:

- ✓ Private ownership of the means of production under the division of labor. Ownership gives owners the ability to manage and control the services learned from various benefits. (Private

ownership means that the owners determine the direction of use of production factors, whereas public ownership means that their use is controlled by the state) [2] In the conditions of private ownership, subjects of market relations are economically isolated; they are independent, autonomous in making economic decisions. Market subjects are the owners of various goods (assets, products, etc.), they can easily dispose of them by establishing, implementing and transferring their property rights by transactions in the market. In the conditions of economic isolation, independence and autonomy in decision-making, the actions of people and their organizations (including with one or another state participation) associated with the production and exchange of various goods start managing business interest and market information, directing the actions of hotel people and their organizations to best respond to the wishes of others, above all, consumers.

✓ Modern methods of economic calculation mainly based on the monetary valuation of capital. In competitive conditions, when each entity in the market, at its own risk, conducts activities related to the realization of its goals, and directed (as it assumes and plans) to improve its position, the assessment of the volume of savings and the resulting savings of capital goods are the basis for assessment of the economic efficiency of its actions, including the overall results of entrepreneurship in the market. The amount of capital, estimated in monetary units, is the starting point and the measure of the success of the business of a particular entity, estimated as a result of its economic calculation.

✓ Modern market legislation (as well as traditions and rules that are not fixed in regulatory legal acts), creating conditions for entrepreneurship based on private initiative, unreformed conditions of competition. Freedom of entrepreneurship in the market is ensured, inter alia, by the norms of market legislation governing such areas as: property rights; contracts between economic agents, the order of commencement and termination of business activities (procedures for opening firms or registering legal entities, mergers, acquisitions and bankruptcies of organizations), maintaining a competitive environment, and so on. Legal norms defining the rules of behavior of subjects in the market are aimed at supporting and developing unreformed competition conditions [2](An outstanding feature of the Western nations was that they succeeded more in containing the spirit of predatory milita-

rism than the rest of humanity, and created the public institutions required for savings and investment on a wider scale. Even Marx did not dispute that private initiative and private ownership of the means of production were a necessary step on the way from primitive need to more satisfactory conditions in Western Europe and North America in the 19th century. The East Indies, China, Japan, and Muslim countries lacked the institutions guaranteeing the rights of individuals. The arbitrariness of pasha, *cadi*, *rajah*, *mandarin* and *daimyo* did not contribute to large-scale capital accumulation. The basis of unprecedented economic progress in the West became legal guarantees effectively protecting the individual from expropriation and confiscation. These laws were not the result of opportunity, historical chance, or geographical location. They were the products of the mind.

✓ Highly developed commodity-money relations based on the priority of contractual relations. In these markets, there is a free market exchange of goods based on cooperation of people and organizations, built on a contractual basis. On a contractual basis, various subjects have the opportunity to exchange the produced goods and services, and they are able to use the products of any other (exchanged voluntarily under the contract) specific products (things and other labor results), services, rights, etc.

✓ Free pricing based on the interaction of sellers (suppliers) and buyers. Pricing for goods exchanged in markets with developed competitive conditions is based on the interactions (estimates) of business entities engaged in these transactions. Exchange (trade) transactions in the market are carried out only when each of the parties to the transaction is considered, resulting in values higher than what it gives. In the end, prices on the market "... are entirely determined by the subjective assessments of the existing individuals" (Estimates leading to the establishment of specific prices are different. Each side gives more value to the product it receives, compared to the one that gives. The exchange ratio, the price, is the result not of equality of estimates, but on the contrary - differences of estimates) [2]. Prices formed on the market are not distorted by the excessive intervention of government agencies, as well as by the monopoly position and activities of individual suppliers or their groups.

✓ Antitrust and regulation. The possibilities and conditions for establishing monopoly prices due to the monopoly of various service providers or their groups have been minimized. Spheres of distribution, exchange and production are demonopolized. Functioning, competing in the market, the subjects of various forms of management, large, medium, small organizations, managed not from a single center, but by independent producers.

✓ Modern market infrastructure. A special complex of infrastructure services is being developed providing market actors with the opportunity to exchange extensive market information, as well as allowing them to make and execute transactions with minimal transaction costs. The most important result of the operation of this infrastructure is that it creates favorable conditions conducive to the exchange and dissemination of market information, which can be used by market actors in their business. Market infrastructure based on digitalization helps reduce transaction costs - exchange costs associated with the transfer of ownership, minimizes the costs associated with organizing the interaction of subjects in the market, with access to trade operations in publicly available trading systems, finding information about consumers and delivery terms, with negotiations, advertising, payment for services of organizations servicing and controlling the sphere of trade, etc. Competitive interaction, free pricing using modern market infrastructure (electronic trading platforms, stock exchanges, settlement, billing centers, and so on) allows to significantly and qualitatively increase the efficiency of the market system, and creates conditions for its rapid development. Operating on the basis of modern information technologies, organizations of a modern market infrastructure providing the most important conditions for the free movement of goods, capital, people, serving as important intermediaries between producers and consumers of various goods and services, playing a crucial role in the credit and financial system, carrying out purchase and sale operations securities, owners of savings with future investors, providing production with capital and performing many other functions.

✓ Special self-regulation systems of subjects in various fields of activity, formed on a voluntary basis from among the subjects of certain markets. Their activities are aimed at improving the efficiency of transactions in these markets, as well as the development of the rules and procedures of the relevant markets.

• Support and development of a market system by government agencies.

Public authorities (together with the self-government bodies of market entities) contribute to the formation and use of fair conduct rules or rules of non-deformed competition, equally applicable to all participants in the market process, including when developing and adopting new legislation, as well as using legislation, regulatory relations in the market. The need for an active position of state structures in maintaining and developing market systems is determined by the fact that "... Competition creates a very special state of affairs that can never be created by the abovementioned instructions. Competition, if it does not interfere, creates a position in which it will be firstly produced everything that anyone can produce and can sell at a profit at a reasonable price for the buyer. Secondly, everything will be produced by those who can do it, at least cheaper than by anybody else (although this one actually may not produce this product). Thirdly, everything will be sold at a lower price (or at least as low) which in principle could be assigned by someone who, in fact, does not sell goods" [5]. In modern markets with developed competition, as a rule, the political leadership of the country (together with market self-government bodies) takes measures to considerably reduce interventionism, excessive government intervention in market processes, and measures are being taken to create conditions and rules of fair competition, followed by legal and power support [5] (It's just that even "imperfect competition" - in the conditions that we are able to create, is preferable to any other regulatory mechanism - in particular, state management of the economy).

• Compliance with consumer sovereignty in the market. Free, unreformed conditions of competitive interaction between suppliers and consumers can be achieved only by creating conditions for consumer sovereignty, when conditions are created under which the commercial success or failure of any supplier of goods depends on consumer behavior, on their buying decisions, or on their refusal to buy one or another goods. Modern economic theory is based on the fact that "What is the effect of the free market in which the consumer, i.e. any citizen, is independent, gives more satisfactory results than the instructions of the rulers" [2] and commercial success in the market is primarily determined by the effectiveness of the services provided by an entrepreneur to its customers.

Therefore, in modern models of markets with developed competition conditions, the issues of ensuring direct participation of consumers in competitive procedures and exclusion (elimination) of conditions of monopolistic behavior of suppliers leading to the establishment of monopoly prices come to the fore. In efficient markets, special measures are taken for making the conditions and possibilities for the active participation of consumers in competitive procedures, i.e., special measures are being taken to ensure the sovereignty of consumers in the market.

4. Discussion

Evaluation of the experience and problems of the functioning of the reformed electric power industry in economically developed countries [4 -14] shows that it has not been yet possible to create an EER with the expected performance indicators and to form in the sphere of production, transmission and consumption of electricity conditions of free competition. Many markets in the main parameters do not meet the required characteristics. This can be seen in almost all elements of the market determining the conditions for the competitive interaction of its subjects, including the real and virtual sectors of the economy [4]. In essence, these conditions indicate that in this market with its inherent features, it was not possible to complete the reforms by creating conditions for free competition. When carrying out reforms in the electric power industry, the main emphasis was placed on achieving the necessary levels of reliability, on striving to minimize the impact of reforms on social processes, while providing the necessary conditions for competition was paid less attention. Given the incompleteness of the reform stages [4, 9, 10, 11], it is necessary to correct them by adding them to modern rules of regulated competition. Despite some restrictions arisen due to the EER characteristics (having a technological basis), in order to improve the efficiency of the electricity supply sphere, it is necessary to achieve competitive conditions corresponding in their basic characteristics to the properties of modern developed markets. In the current conditions for experts immersed in the issues of the functioning of the EER, it is obvious that after the “running in” of “target models of the electric energy and power market”, it is necessary to implement a qualitatively new set of measures for the development of this market. It is expedient to do this considering the “industry-specific” features; the social

significance of the electric power industry, etc. Nevertheless, at the same time, in developing measures for the development of this market, the achievement of the characteristics of modern markets with developed competition should not be prioritized less. Such an approach will ultimately allow to satisfactorily solve the problem of increasing efficiency in the power industry.

5. Conclusion

The introduction of free competition conditions supported by soft government regulation on the EER should not be a one-time campaign, but a constantly improving process. In certain countries implementing serious structural reforms of the electric power industry, after certain periods, there are tasks of state adjustment of approaches to further development of competitive mechanisms, development of infrastructure and rules for the functioning of these markets in the interests of balancing the interests of government, business and population. This is while, the importance of solving problems of increasing the efficiency of the electric power industry dictates the need for concerted actions by state structures and market actors to change and further develop the system of economic and social relations in this market.

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