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THE REFORM OF THE ELECTRIC ENERGY SYSTEM IN UKRAINE

Summary: The main problems connected with the functioning of electric energy market in Ukraine include: losing control over part of the energy infrastructure and raw material resources due to the annexation of the Crimea and civil war in the eastern part of the country, excessive energy dependency on Russia, too low energy prices, unstable political situation, corruption and oligarch-oriented economy. The starting point for the Ukrainian electric energy in the reform era should be considered as critical: considerable part of the infrastructure is outdated and used in an inefficient way and traditional system of providing such raw materials as gas, coal or enriched uranium has broken down, which makes it difficult to obtain energy independence and self-sufficiency from Russia. The answer to all those recognized problems and potential threats is the programme of profound reforms and changing of the model of functioning of electric energy market, whose main aim is modernization and making the system market-oriented as well as its full integration with the European system.

Key words: Electric energy sector in Ukraine, Reform of the electric energy market.

1. INTRODUCTION

Annexation of the Crimean Region by the Russian Federation and civil war in the eastern part of Ukraine have drastically revealed weaknesses and shortages of the system of production and distribution of energy in Ukraine. In order to overcome the crisis, the Ukrainian authorities face the necessity of a profound reconstruction and reforming of the whole system of providing both households and institutional clients with electric energy that has proved so far very inefficient.

The contemporary structure of that sector originated in the nineties of the 20th c., when state vertically integrated energy companies were divided into independent economic entities producing, distributing or sending electricity. Such system decentralization have resulted in very differentiated consequences for specific electric energy sub-sectors but it has not led to complete getting rid of the state

monopoly at the wholesale level, which still exerts very strong influence both on the production of the sub-sector as well as on retail selling.

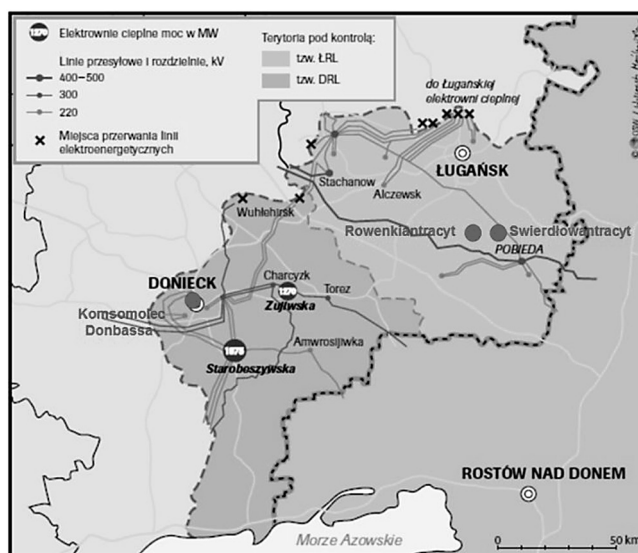
2. BASIC PROBLEMS OF UKRAINIAN ELECTRIC ENERGY SECTOR AS THE MOST IMPORTANT CONDITIONING OR THE PROCESS OF REFORMS

Ownership changes in the recent years have led to the establishing of a peculiar oligarch-state model of that sector with very limited transparency of rules for the new market participants and practical lack of competition between already existing subjects.

The events from the years 2013/2014 have resulted in losing of control over a considerable part of highly energetic coal (anthracite) and a few large conventional power plants (coal, gas and mazut type).

The map below presents the location of 3 lost important anthracite coal mines and breaking occurred with at least 8 energy transmission and distribution lines.

Diagram 1. Eastern area of Ukraine beyond the government's control



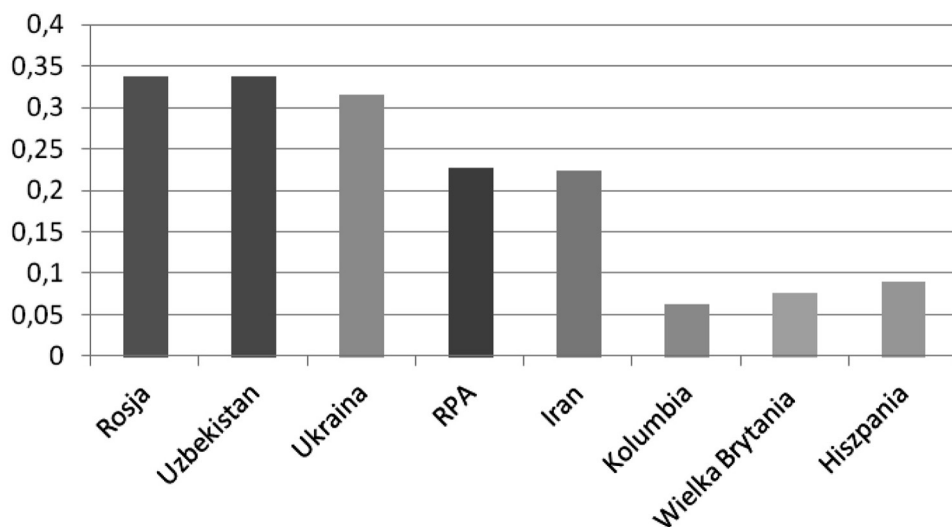
Source: one's own elaboration according to T. Iwański, A. Sarna, *Partnerstwo polityczno-oligarchiczne. Stan i wyzwania sektora elektroenergetycznego Ukrainy*, Ośrodek Studiów Wschodnich im. Marka Karpia, [Political and Oligarch Partnership, Condition and Challenges Facing the Electric Energy Sector in Ukraine. Marek Karp Eastern Studies Centre] Warsaw 2017, p. 78.

However, the lack of governmental control over eastern territories of Ukraine is not the only significant operation condition of the electric energy sector.

The most important condition influencing the energy crisis in Ukraine that has been made even more severe after losing access to anthracite coal from the rich

resources being now under separatists' control is – alongside the inefficient and unclear regulatory system – high energy consumption of the Ukrainian economy. The scale of this phenomenon is illustrated by data contained in the below diagram.

Diagram 2. Energy consumption of Ukrainian economy against some selected countries in 2015 (koe/\$2005p)



Source: one's own elaboration according to V.V. Dykan', L.B. Bilous, 2016, *Problemy optyimizacji struktury energoyemnosti Ukrainy*, „Socyal'naya ekonomika” vol. 52, no 2 p. 86-92.

Note: koe/\$2005p – an index of GDP energy consumption kilogram expressed in oil equivalent per constant purchasing power parities in dollars

As can be seen in diagram 2, Ukraine is still dominated by its heritage from the times of the Soviet Union as when its economy's huge energy consumption is concerned it is ranked at the top, just behind Russia and Uzbekistan – the countries that have also evolved from the same economic system, where there was no need to save energy and rationally exploit its original sources.

The following element inherited from the Soviet system is the lack of social awareness as regards efficient use of energy, which results in, among others, breaks in providing heating during the winter season. The problems of the electric energy sector, especially its total lack or delays in modernizing its infrastructure as well as recurring breaks in providing electricity have effectively hindered the economic growth in Ukraine and the possibility of taking a full advantage of its economic potential.

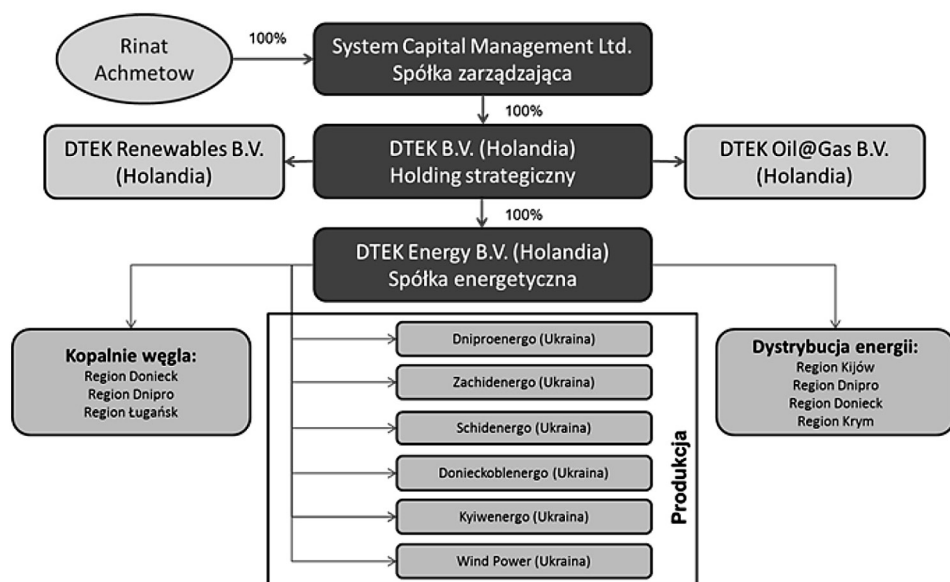
According to market analysts but also to the Ukrainian Ministry of Energy and Coal Industry (MEiPWU) [Iwiński, Sarna 2017]¹, one may indicate 4 main drawbacks connected with this energy sector:

¹ See broader in the Reports: Zvit z ocinki vidpovidnosti (dostatnosti) generuyuchih potuzhnostey, Ukrenergo 2017.; Energetichna strategiya Ukrainy na period to 2035. Ministerstvo energetyki ta vugilnoy promyslovosti Ukrainy, approved by the Ministers' Council's resolution no 605 from 18 August 2017.

- limitations as regards obtaining one's own energy natural resources: lack of control over coal deposits in areas controlled by separatists, no restructuring of unprofitable coal mines, decrease in gas extraction due to lack of beneficial investment climate, especially for foreign investors,
- excessive dependency on Russia: import of anthracite coal, gas import, import of uranium, unfavourable location of energy transmission networks and pipelines,
- too low energy prices that do not ensure enough motivation to save energy and do not allow to cover the actual prices of its production and distribution as well as to accumulate means for modernization investments,
- unstable political situation related with the annexation of the Crimea and civil war in the East as well as Russia's strivings to limit or even eliminate transit of Russian gas through Ukraine on its way to Europe.

Following the official documents issued by MEiPWU one may observe two more significant problems related to the energy sector operations: corruption (bribery) and oligarch dominance. The first phenomenon is testified not only by easily visible, for example, in web news services, efforts by the state institutions and entities to provide clear and publicly accessible detailed statistical information, reports concerning government's offices and agencies supervised by the state but also in the presence of content and even whole sections devoted to fighting corruption. Oligarch dominance is proved, on the other hand, by the fact that

Diagram 3. Structure of the holding controlled by R. Achmetow



Source: one's own elaboration according to the reports by the company: FY 2016 Results Corporate Presentation DTEK Energy B.V. April 2017 and DTEK Integrated report 2016. Financial and non-financial results.

as much as 70% of electric energy production in conventional power plants is controlled indirectly by just one person: Rinat Achmetow [Iwiński, Sarna 2017].

The preparation of a development strategy of the sector was a reply to the actual crisis situation of the sector. It determined three stages of a reform, modernization and new investment:

Stage 1 – till 2020: Reforming of the energy supply system.

Main emphasis is put on implementing system reforms and creating of competitive environment that may encourage investments in the sector.

Stage 2 – till 2025: Optimisation and innovative development of energy infrastructure.

Concentrating on operations in the new market environment and on actual integration of the Ukrainian energy system with a similar system in Europe.

Stage 3 – till 2035: Providing sustainable growth.

Building infrastructure of a new generation. Investment in new generating powers in order to replace the removed ones.

The scale of necessary reforms and modernization processes are determined not only by political, social and legislative conditioning but also, and maybe first of all, by the existing condition of infrastructure of the sector in question.

3. STARTING CONDITION OF THE ELECTRIC ENERGY SECTOR IN UKRAINE

In so far organizational model of the electric energy sector there has been a monopsony and the only actual buyer of the whole produced energy was the Wholesale Market of Electric Energy (HRE). The participants of the market in 2017 were a few hundred business entities of all forms of ownership, including the most importants such as²:

- about 165 producers of electric energy
- wholesale provider of electric energy – „Energorynok” State Enterprise
- the operator of transmission lines and international energy networks, the state enterprise of „Ukrengo, State Energy Company”
- 123 sellers of electric energy

The production of electric energy in spite of apparent diversification is concentrated in a few entities managing a few dozen power generating plants³ that include:

- 5 partnerships of conventional energy (coal or gas and mazut power plants), including:

² The elaboration was prepared according to data by the Ministry of Energy and Coal Industry of Ukraine (Міністерство енергетики та вугільної промисловості України), of the National Committee for the Regulations of the Energy Sector and Communal Services (Національна комісія, що здійснює державне регулювання у сферах енергетики та комунальних послуг) and information from websites of the relevant business entities.

³ Note: some forms of ownership of Ukrainian companies do not have Polish equivalents.

- DTEK⁴ Dniproenergo Public Shareholding Partnership – 3 conventional power plants,
- Donbasenergo Public Shareholding Partnership – 2 conventional power plants, both beyond the control,
- DTEK Zachidenergo Public Shareholding Partnership – 3 conventional power plants,
- Centrenergo Public Shareholding Partnership – 3 conventional power plants,
- DTEK Schidenergo Limited Liability Partnership – 3 conventional power plants, 2 beyond the control.
- 1 partnership of nuclear energy
 - Energoatom State Enterprise of National Partnership of Nuclear Energy: 4 nuclear power plants, 1 water power plant, 1 pumped-storage hydroelectric power plant.
- 1 hydroelectric energy partnership
 - Ukrgidroenergo Public Shareholding Partnership: 7 largest water power plants and 2 and 2 pumped-storage hydroelectric power plants.

The less significant energy producers include:

- 29 professional heat and power generating plants and producers of small power, i.e. bloc stations,
- 137 producers basing on alternative (renewable) sources of energy, including:
 - 8 entities running in total of 28 small water power plants,
 - 7 producers of wind energy,
 - 45 producers of electric energy from micro-, mini and small water power plants,
 - 60 producers of solar energy,
 - 15 producers of energy from biomass and biogas,
 - 2 producers who produce their electric energy in water and solar power plants.

The well diversified and numerous – as it may seem – subject structure of the energy market does not reveal real proportions as regards the production of electric energy.

Table 1. production structure of electric energy in Ukraine acc. to the situation in 2016

Technology type	Share in generating power	Share in energy production
Nuclear power plants	24,42%	53,91%
Conventional power plants and power and heat generating power plants	60,55%	37,67%

⁴ DTEK – ДТЕК – Донбаська паливно-енергетична компанія, Donbas Fuel and Energy Partnership – concern controlled by the oligarch – Rinat Achmetow (Рінат Леонідович Ахметов).

cd. Table 1.

Technology type	Share in generating power	Share in energy production
Large water power plants	11,08%	6,06%
Renewable energy resource power plants, including:	1,97%	1,18%
■ solar type	0,94%	0,33%
■ wind type	0,77%	0,62%
■ small water type	0,16%	0,13%
■ for biomass	0,07%	0,05%
■ for biogas	0,04%	0,06%
Total	100,00%	100,00%

Source: one's own elaboration according to the data provided by the National Academy of Statistics, Accountancy and Audit (Національна академія статистики, обліку та аудиту).

As results from the above data, the main own source of energy production are nuclear power plants, although, their share in installed power generating facilities is considerably smaller than the conventional power plants, whose importance has been recently decreasing constantly in the whole system of electric energy due to the lack of modernization and investments in the sector.

Table 2. Forecast of changes of electric energy production in Ukraine

Type of power plant	2020 r.	2025 r.	2030 r.	2035 r.
Nuclear power plants	51,8%	50,8%	49,7%	48,2%
Conventional power plants and power and heat generating plants	36,6%	35,8%	33,7%	32,3%
Water power plants	6,1%	6,7%	7,0%	6,7%
Renewable energy resource power plants	5,5%	6,7%	9,6%	12,8%
Total	100,0%	100,0%	100,0%	100,0%

Source: one's own elaboration according to Energetichna strategia ... op.cit, Appendix 2.

Large and ever increasing number of renewable energy resource producers have still practically marginal share both in installed power facilities as well as in the production of electric energy. However, such situation should gradually improve – according to the official forecasts.

The fact is worth emphasizing that only a small part of the electric energy system in Ukraine based on power plants located in the western part of the country is currently integrated with the European system, i.e. have a physical possibility of exporting and importing electric energy to and from the EU countries.

4. ASSUMPTIONS OF THE REFORM OF THE ELECTRIC ENERGY SECTOR

The authors of the development strategy of the electric energy sector have determined a few priority areas of activities, mostly of political character which – in their opinion – should contribute to overcoming the crisis phenomena in Ukrainian electric energy sector and clearly establish relations between all participants on that market. These priorities may be summarized by the following issues⁵

- reform of the regulatory mechanism on the energy market, including electric energy,
- considerable improvement of the efficiency of domestic energy system through its modernization or replacing the existing energy infrastructure with a new one,
- more complete use of the national potential as regards held original source of energy as well as the production and distribution infrastructure,
- systematic and fast decrease of energetic dependency on the Russian Federation as regards import of both energy carriers and energy itself.

The process of creating basic framework for the political actions aimed at the above priorities has already been started, by among others, passing an act on electric energy market, establishing the National Council for Reforms (August 2014). One of its tasks was to consolidate the legislation concerning the market of electric energy and gas as well as to establish an independent regulatory body in the form of the National Committee for the Regulation of the Electric Energy Sector and Communal Services (September 2016).

As a result, the regulatory activities aimed at increasing the energy market's transparency are to enhance the competition on this market by changing the subject structure dominated so far by huge concerns, mainly controlled by the state.

The planned reforms as regards energy tariffs will allow to adapt prices for all users to the market level, which will result in providing the producers with the possibility to accumulate financial means necessary to carry out modernization of the existing infrastructure or build a new one. The regulator's intervention involves also some subjects on the market. For example, in the state oil and gas concern of Naftogaz, an external accountancy audit has been introduced as well as the obligation to publish annual reports from its operations. Also the scale of subsidies for coal mining and its processing is being limited. For the year 2018, a broad programme of privatization is planned comprising, among others, 11 subjects from the electric energy sector and one subject from the extraction and processing industry.⁶

Improving efficiency of the domestic energy system and more complete use of national potential will be the result of:

- systematic decrease of the energy consumption by the economy (to the level of 0.13 koe/\$2005p in year 2035),

⁵ Energetyczna strategia ..., op.cit.

⁶ Raport: Privatization 2018. State Property Fund of Ukraine.

- constant increase of domestic prices of energy with providing the inhabitants at the same time with social security with the aid of the World's Bank (the process of multi-stage price increase was finished in 2017),
- installing and making gas meters more available in the heating infrastructure (the process has largely been initiated and is still in progress),
- continuing overhauling and replacing of out of date energy infrastructure with the aid of some external sources such as the European Bank for Reconstruction and Development (EBOR), (a wide plan of modernization and investment in the energy sector was adopted and implemented),
- widespread information campaign in the society on the need of saving energy,
- improvement of investment climate concerning especially transparency and stability of statutory and executory regulations as well as making energy tariffs more corresponding to the current economic situation.

Being less dependent on Russia is a result of a few significant actions, especially such that lead to increasing the country's energy independence:

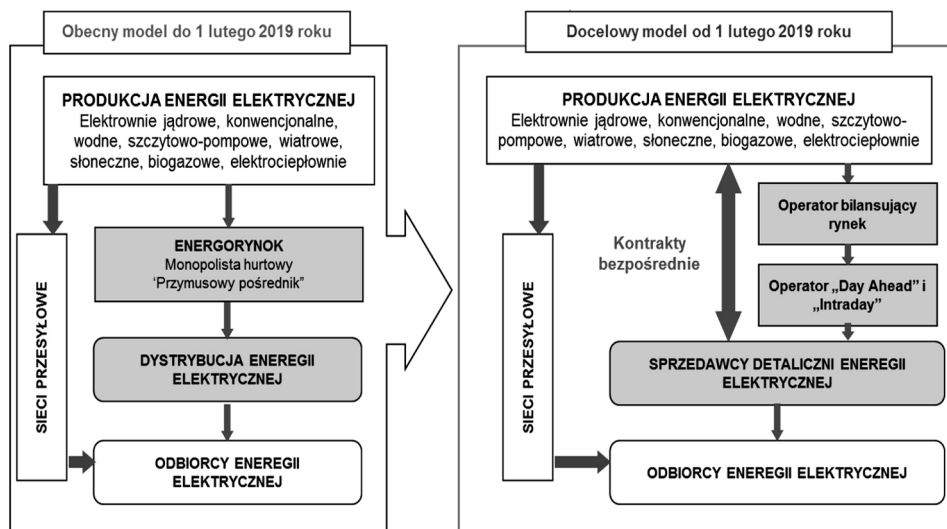
- in short term perspective by making more efficient use of already existing nuclear power plants and diversification of fuel import sources for the nuclear reactors (in 2017, 55% of imported nuclear fuel was carried out by Westinghouse concern),
- in long term perspective, by improving average working efficiency of heat recovery in already existing conventional coal power plants due to their modernization or replacing out of date objects that do not qualify to be rationally modernized,
- by expanding the port in Odessa for the needs of importing anthracite coal through the Black Sea (in 2015, 29% of coal was supplied from outside Russia),
- by reducing the amount of gas imported directly from Russia by way of inverted gas supplies from Europe (in 2015, 63% of gas supplied was from the EU countries).

It is worth emphasizing that in the process of reforms of the Ukrainian energy sector many countries and international organizations are involved, without whose support such process could not proceed at such pace and in such scale⁷.

5. CHANGING OF THE ORGANIZATIONAL MODEL OF THE ELECTRIC ENERGY SECTOR

The core idea of the reforms of the Ukrainian electric energy sector is changing its model of functioning that is to take place on 1 February 2019.

⁷ Detailed comparison of enterprises, beneficiaries and sponsors is contained in the report: The Progress Report on G7 Energy Sector Support for Ukraine, G7 Kitakyushu Energy Ministerial Meeting, 2016.

Diagram 4. Changing of the model of electric energy market in Ukraine

Source: one's own elaborations according to FY 2016 Results Corporate Presentation DTEK ENERGY B.V., April 2017 r.

Note: pink colour marks areas undergoing change.

Market „Day Ahead”

Market „Intraday”

In the current model there is just one state wholesale intermediary to whom all producers are obliged to sell all their produced electric energy (beyond one's own consumption). The purchase price depends on the technology of producing such energy i.e. the type of a power plant that produces and supplies such energy to the system. Reselling of energy by the wholesaler takes place either by regulated price (tariff one) or non-regulated (outside the tariff), taking into account also the way it was produced. Retail distributors sell energy to inhabitants according to tariffs determined by the National Committee for the Regulation of the Energy Sector and Communal Services.

In the reformed model, producers will be able to conclude bilateral contracts to sell their produced energy to commercial clients – retailers. Companies that run retail selling should be organizationally separated from the producers and wholesale operators. The act prescribes also guarantees of independence and free access to the network by market participants according to public orders.

In connection with getting rid of the only wholesale intermediary, it is necessary to introduce a new mechanism balancing the production and consumption of electric energy as well as the obligation of reporting by the market participants of hour diagram of the amount of bought and sold electric energy.

6. SUMMARY

The basic idea behind the reforms of the Ukrainian electric energy system is demonopolization of wholesale electric energy trading and allowing establishing of direct relations between the producers and clients.

The strategy that was adopted for the sector till 2015 as well as all accompanying documents assume removing of the main drawback of the system by modernization of existing or building of new infrastructure, becoming independent as regards raw materials and energy from Russia, increasing system efficiency by reducing energy consumption of the economy, fighting corruption and promoting energy saving economy among all market participants.

Final breaking up of the strong ties with Russia will take place at the time of full integration of the whole Ukrainian energy system with that of the European Union.

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REFORMA SYSTEMU ELEKTROENERGETYCZNEGO UKRAINY

Streszczenie: Do głównych problemów związanych z funkcjonowaniem rynku energii elektrycznej na Ukrainie należą: utrata kontroli nad częścią infrastruktury energetycznej oraz zasobów surowcowych w związku z aneksją Krymu i wojną domową na wschodzie kraju, nadmierne uzależnienie energetyczne od Rosji, zbyt niskie ceny energii, niepewna sytuacja polityczna, korupcja i oligarchizacja. Stan wyjściowy ukraińskiej elektroenergetyki w dobie reform należy uznać za krytyczny: znaczna część infrastruktury jest przestarzała i wykorzy-

stywana w sposób nieefektywny, a tradycyjny system zaopatrzenia w takie surowce, jak gaz, węgiel czy wzbogacony uran, uległ załamaniu, co utrudnia osiągnięcie energetycznej samowystarczalności i niezależności od Rosji. Odpowiedzią na rozpoznane problemy i zagrożenia jest program głębokich reform oraz zmiana modelu funkcjonowania rynku energii elektrycznej, których głównym celem jest modernizacja i urynkowanie systemu oraz jego pełna integracja z systemem europejskim.

Słowa kluczowe: elektroenergetyka Ukrainy, reforma rynku elektroenergetycznego.

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