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Anastasiia Koliesnichenko
PhD (Economics),
Assistant Professor,
National Technical University «Kharkiv Polytechnic Institute»
2 Kyrpychov Str., Kharkiv, 61002, Ukraine
anastasihpi@gmail.com
ORCID ID: https://orcid.org/0000-0002-5007-9082

Iryna Yuryeva
PhD (Economics),
Associate Professor,
National technical University «Kharkiv Polytechnic Institute»
2 Kyrpychov Str., Kharkiv, 61002, Ukraine
yuryeva.irina@i.ua
ORCID ID: https://orcid.org/0000-0002-8159-7763

Restructuring of the electricity market in view of transformation and pricing challenges

Abstract
Introduction. The study introduces several most significant empirical and analytical findings covering the issue of electricity restructuring. In this regard, it details the data set on electricity framework in order to investigate tendencies and the main challenges in the market structure following the regulation and deregulation processes of the electricity sector, as well as the consequences for pricing.
Purpose. The purpose of the study is to analyze key aspects of the restructuring of electric energy markets in order to determine the main challenges related to justification of the optimal structure of the industry with this framework, as well as to establish the dependence between reforms, structural transformations and price volatility in the energy market.
Methods. To achieve the research results we used the methods of comparison, retrospective and evidence-based analysis, generalization and systematization. Restructuring of the electricity market under such methods depends on complicated factors with regard to network utilities, technological, institutional aspects and its strategic role in the whole national economic system. An overview of electricity production and pricing in the world and different European countries has been worked out with a special regard to functioning of the ENTSO-E pan-European energy system. Based on the results of the correlation and regression analysis, the authors of the article have revealed the dependence of average price values in the night and day periods on the balancing market of Ukraine, which acts as an organized segment of the electricity market as a result of the reform.
Results. It should be noted that deregulation and restructuring of energy companies have been determined by the transition to competitive relations and made it possible to solve significant problems in different fields of activity, including tariffs, participants' interests, energy efficiency, etc. Consequently, reforming of the energy market structural components should be comprehensively implemented in order to avoid fragmentary imbalances and the impact of price distortions on the participants of the electricity market.
Further research is necessary to develop the current business processes relating to restructuring electricity market.
Keywords: Restructuring; Electricity Market; Deregulation; Regulation; Pricing; European energy system
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Колєсніченко А. С.
кандидат економічних наук, старший викладач кафедри економічного аналізу та обліку,
Національний технічний університет «Харківський політехнічний інститут», Харків, Україна
Юр'єва І. А.
кандидат економічних наук, доцент, доцент кафедри економічного аналізу та обліку,
Національний технічний університет «Харківський політехнічний інститут», Харків, Україна
Реструктуризація ринку електроенергії в контекстітрансформаційних процесів і ціноутворення
Анотація. Дослідження спрямовано на формування ключових практичних й аналітичних висновків, що стосуються проблем реструктуризації електроенергетики. Для цього виявлено найбільш значущі структурні особливості функціонування електроенергетичного ринку, що дозволило висвітлити деякі існуючі тенденції

й основні проблеми в структурі енергоринку, пов'язані з процесами регулювання й дерегулювання, а також проаналізувати вплив трансформаційних процесів на встановлення цін на електроенергію на прикладі ринку електричної енергії України, що перебуває в стадії реформування.
Результати дослідження отримано із застосуванням методів порівняння, ретроспективного аналізу, методів узагальнення й систематизації, а також методів кореляційного й регресійного аналізу. Проведений аналіз предмета дослідження дозволяє зробити висновок, що дерегулювання та реструктуризація енергетичних компаній були визначені в якості переходу до конкурентних відносин і дозволили вирішити значні проблеми в різних сферах господарювання. Отже, реформа структурних складових енергоринку для функціонування учасників ринку електроенергії має здійснюватися комплексно з метою уникнення фрагментарних диспропорцій і впливу цінових спотворень.
Ключові слова: реструктуризація; ринок електроенергії; дерегулювання; регулювання; ціноутворення.

Колесниченко А. С.
кандидат экономических наук, старший преподаватель кафедры экономического анализа и учета,
Национальный технический университет «Харьковский политехнический институт», Харьков, Украина
Юрьева И. А.
кандидат экономических наук, доцент, доцент кафедры экономического анализа и учета,
Национальный технический университет «Харьковский политехнический институт», Харьков, Украина

Реструктуризация рынка электроэнергии
в контексте трансформационных процессов и ценообразования

Аннотация. Исследование направлено на формирование ключевых практических и аналитических выводов, касающихся проблем реструктуризации электроэнергетики. С этой целью выявлены наиболее значимые структурные особенности функционирования электроэнергетического рынка, что позволило осветить некоторые существующие тенденции и основные проблемы в структуре энергорынка, связанные с процессами регулирования и дерегулирования, а также проанализировать влияние трансформационных процессов на установление цен на электроэнергию на примере рынка электрической энергии Украины, реформируемого в настоящий момент.
Результаты исследования были получены путем применения методов сравнения, ретроспективного и доказательного анализа, обобщения и систематизации, а также корреляционного и регрессионного анализа. Проведенный анализ предмета исследования позволяет сделать вывод, что дерегулирование и реструктуризация энергетических компаний были определены в качестве перехода к конкурентным отношениям и позволили решить значительные проблемы в различных сферах хозяйствования. Следовательно, реформа структурных составляющих энергорынка должна осуществляться комплексно во избежание фрагментарных диспропорций и ценовых искажений функционирования участников рынка электроэнергии.
Ключевые слова: реструктуризация; рынок электроэнергии; дерегулирование; регулирование; ценообразование.

1. Introduction

The transformation of the electricity industry and the process of regulatory restructuring have been proceeding unevenly over the last three decades. Despite the fact that concept of deregulation in the power industry remains viable as a natural consequence of similar initiatives that have been successfully implemented in the fields of air transportation, trucking, IT technologies and telecommunications and natural gas production, participants at the relevant market anticipate challenges and complications entailed in introducing competition into the power industry [1].

The problem turns acute because of the trend towards raising electricity consumption. To support this conclusion, we have created Figure 1, showing the world electricity generation.

With the rising global demand for electricity the issue of changes in price policies and price formation trends in different sets of regulatory instruments is becoming increasingly important.

Based on the data about retail electric rates in both the deregulated and the regulated sates of the USA (Table 1), it can be concluded that increases in retail electric prices in both the states with deregulated electric markets and the regulated states were relatively constant between 1997 and 2017. Although customers in the regulated states noted a slightly higher increase in rates in percentage points [3].

Under the present market conditions there are national economic sectors which are expected to continue to be subject to price and entry regulation, including distribution and transmission. At the same time, the creation of competitive wholesale and retail markets, and the application of performance-based or incentive regulatory mechanisms to the remaining regulated segments in order to complement the traditional cost-of-service regulation remain relevant. It should be noted that there are directions such as privatization of state-owned enterprises, separation by ownership or functional of potentially competitive segments which are mostly based on generation and retail supply from segments that have natural monopoly characteristics among them [4].

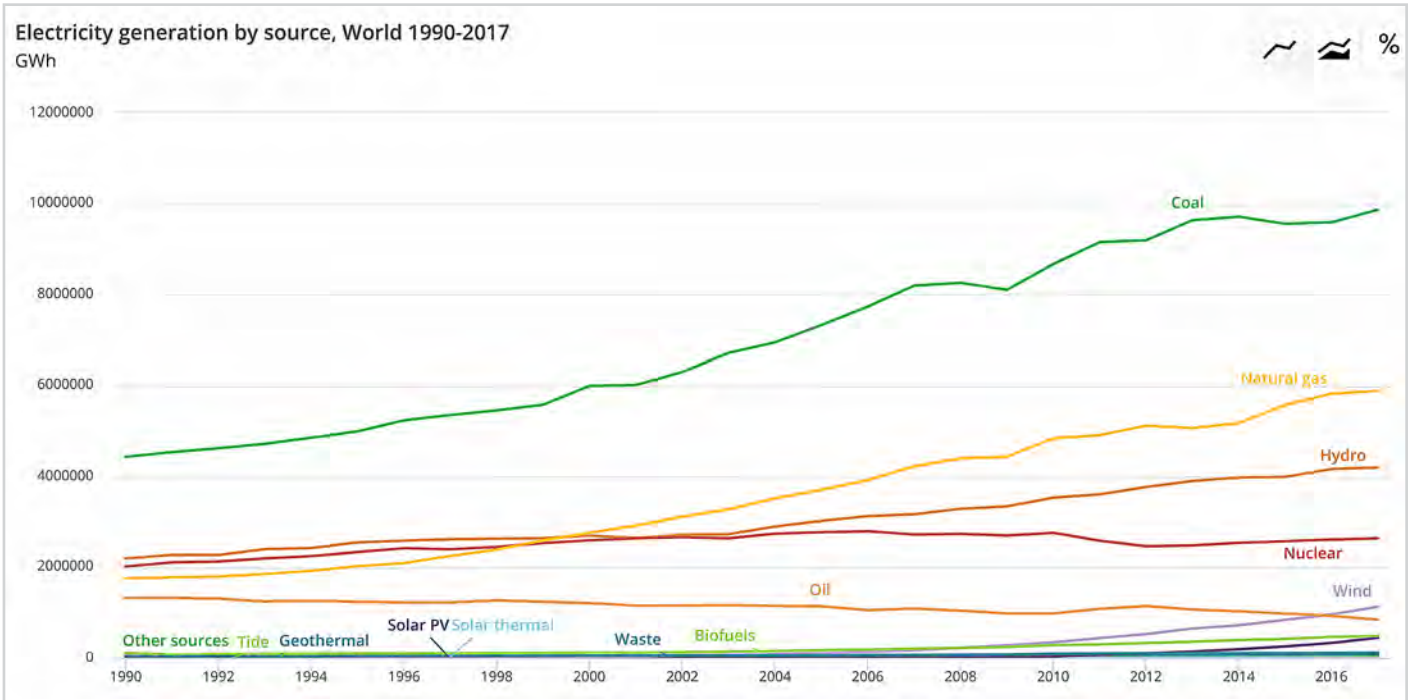

Figure 1:
The dynamics of world electricity generation
Source: Compiled by the authors based on data by the International Energy Agency [2]

During the 1990s, many countries began to restructure their electric power sectors with the goal related to improving performance of such sectors. The restructuring programs have included complex directions and strategies.

This paper provides an investigation regarding restructuring of electricity markets around the word. The focus of the review lies in the aspects of competitiveness and regulation, including issues associated with pricing in key electricity markets and market design.

2. Brief Literature Review

The issue of strategic building and designing by participants in restructured electricity markets has been studied worldwide.

Table 1:
Average revenue per kilowatt-hour: deregulated states vs. regulated states

Year	Average revenue, cents per kWh		Percentage of regulated states to deregulated states
	Deregulated states	Regulated states	
1997	8.1	5.8	71.6
1998	7.8	5.8	74.4
1999	7.7	5.8	75.3
2000	8.0	5.9	73.8
2001	8.6	6.2	72.1
2002	8.5	6.2	72.9
2003	8.8	6.4	72.7
2004	8.9	7.0	78.7
2005	9.6	7.5	78.1
2006	10.7	7.7	72.0
2007	11.0	8.3	75.5
2008	11.7	8.5	72.6
2009	11.5	8.6	74.8
2010	11.5	8.8	76.5
2011	11.3	8.9	78.8
2012	11.0	9.1	82.7
2013	11.3	9.4	83.2
2014	11.8	9.4	79.7
2015	11.8	9.4	79.7
2016	11.5	9.3	80.9
2017	11.8	9.6	81.4

Source: Compiled by the authors based on [3]

In 1983, Joskow and Schmalansee (1983) published «Markets for Power» [5]. In that paper, they illustrated the intellectual origin of the restructuring movement. However, the book does not concern the challenges related to creating a workable and competitive power industry. In addition, the book contains controversial provisions to a good many economists, lawyers and other specialists consistently maintained for dramatic deregulation of the industry.

In the view of Cepeda and Finon (2011), electric generation adequacy and supply reliability are classified as «public good» [6]. In addition, their analysis rejects the fact that electricity's value exceptionally depends on a competitive market. Consequently, price signals from competitive electricity markets are incorrect.

Kleit and Michaels (2013) point out that the current design of electricity markets is vastly more complex than required [7]. In addition, it is determined that capacity prices are not determined by the market, but by executives. Consequently, the theoretical case for existing electricity markets is unsubstantiated by the evidence.

Currently, the issues concerning deregulated retail management, competitiveness level, principals of cost-based electricity market design, new trading rules in accordance with risk minimization, digitization and innovation as contemporary factor energy efficiency are outlined E. L. Prentis (2014) [8], F. D. Muñoz, S. Wogrin, S. Oren & B. Hobbs (2018) [9], E. Prentis, (2011, 2013) [10-11], P. Zummo (2019) [3; 12]. Special attention is focused on key dominants to the analysis of the restructuring of electricity markets which are introduce in their publications by J. Bushnell, E. T. Mansur & K. Novan (2017) [13], A. Tleppayev (2019) [14], Ph. O'Connor (2017) [15], F. Križanič & Ž. J. Oplotnik (2013) [16], A. N. Kleit & R. J. Michaels (2013) [7], C. Batlle, C. Vazquez, M. Rivier, & I. J. Perez-Arriaga (2007) [17], M. Cepeda & D. Finon (2011) [6], A. MacKay & I. Mercadal (2019) [18], S. Cicala (2017) [19], L. W. Davis & C. Wolfram (2012) [20], T. Deryugina, A. MacKay & J. Reif (2019) [21], S. Borenstein & J. Bushnell (2015) [22], E. T. Mansur (2007) [23], as well as E. Stein (2014) [24]. Possibility of voluntary demand restrictions and preferences for dynamic electricity contracts as new patterns in behaviour of the households are studied on the example of Finland by E. Ruokamo, M. Kopsakangas-Savolainen, T. Meriläinen & R. Svento (2019) [13].

3. Identification of Unexplored Parts of the General Problem

Despite the large number of studies, the major challenges related to the restructuring of the electricity market are not fully covered.

4. The purpose of the study is to analyze key aspects of the restructuring of electric energy markets in order to determine the main challenges related to justification of the optimal structure of the industry with this framework, as well as to establish the dependence between reforms, structural transformations and price volatility in the energy market.

5. Results

From the point of view of theoretical applied research, it can be noted that the logistic efficient model of the organization and functioning of the electricity market implies overviewing the role and importance of the development of distributed and generating capacities, forming an innovative way of communication between consumers and the centralized one controlled power system. However, in this case, new requirements and rules of the actors activity in the electricity market concerning infrastructure support and interconnected information flows and management support will also appear.

A study of the regulation approach relating to the restructure processes is required not only in terms of the industry development, but also in terms of theoretical and applied methods, and further economic transformation.

An electricity utility can be interpreted as a network utility [24]. Newbery identifies six main characteristics that help to distinguish network utilities. They are introduced in Figure 2.

However, the characteristics of electric power have caused difficulties in applying the theory of deregulation to this industry. For example, the inclusion (disconnection) of the consumer in the electrical network or the change in its load requires an immediate reaction of the entire network, including both the manufacturers and the consumers of electricity. Otherwise, there is a risk of deviation from the set frequency and voltage, which, if exceeded, can lead to losses of consumers, and, in the worst case, desynchronization and subsequent collapse of the network. Thus, the rigid system requirements for load balancing result in the fact that in real-time trading, end-users are not technically able to observe price changes, let alone react to them by changing their behaviour.

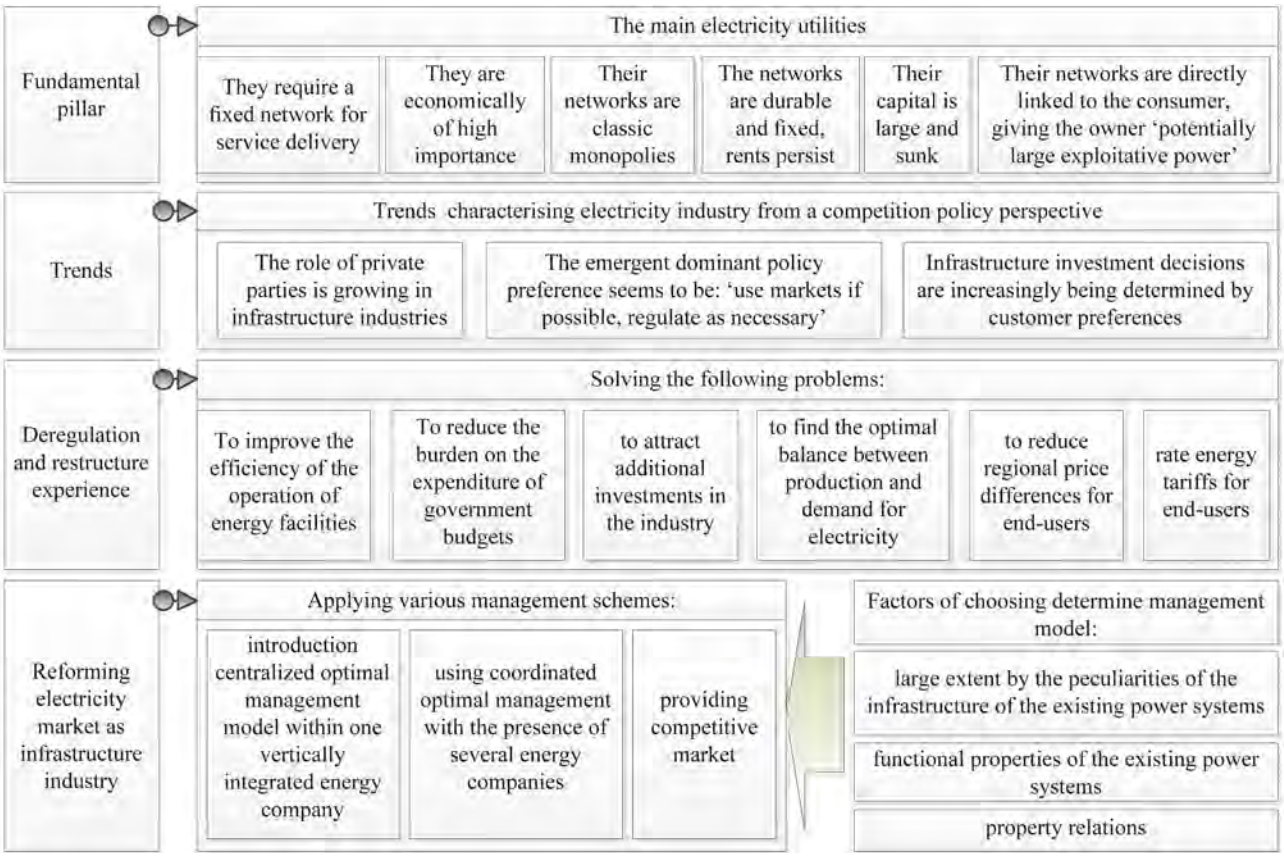

Figure 2:
The main characteristics to distinguish network utilities
Source: Compiled by the authors based on Newbery (2015)

Globally, though, there are three trends that presently determine network industries from with regard to competition policy perspectives. Firstly, the role of private parties is growing in infrastructure industries. Secondly, the emergent dominant policy preference seems to be: «use markets if possible, regulate as necessary». Finally, infrastructure investment decisions are increasingly being determined by customer preferences.

The first trend refers to the circumstance that the traditional state-owned and operated by the state network industries, such as electricity generation and retail, telecommunications, airlines or railways, have undergone a significant process of increasing the number of private players. The second trend is presented with regard to the processes of deregulation and market restructure that has extended through these industries worldwide over the past three decades. The third trend describes in the electricity sector by the consumer drive for green energy, which means that there is more investment in renewable generation and less in traditional fossil fuel generation.

At the end of the nineteenth century, the electricity sector could be characterized as an unregulated competitive industry. Eventually, as the industry consolidated, government regulation was considered as a way to stem the abuse of market influence. The particular market imperfection was introduced with two key factors. On the one hand, it was a natural monopoly. On the other hand, it was government responded with command and control levers of setting the prices.

Since the 1960s, traditional utility regulation has determined market distortions, such as raising costs and entry restrictions arose. Due to policymakers began to introduce regulatory reforms implied deregulation.

Currently, the deregulation of the electricity market can be interpreted as significant restructuring. For instance, the main aspects of this process can be noted as electricity generation segment is more competitive, price policy becomes more open and free, relations between participants bases on principals of market laws, consumers choice is promoted and is diversified.

Based on the experience of the large-scale transformation in the electric power industry of the Scandinavian countries, we can state that the deregulation and the restructuring of energy companies there were determined as a way to transit to competitive relations and allowed to solve related problems such as tariffs, participants' interests, energy efficiency, etc. [26].

Many economists agree that a regulatory reform should begin with restructuring the former monopolist, during which the «cut-off» of natural monopoly business will occur, and the remaining segments will be divided into numerous competitive enterprises. Potentially competitive components of the former monopolists should be privatized and measures taken to ensure that they fall under the general competition law. However, if political considerations make it impossible to fully separate the natural monopoly and the potentially competitive segments, regulation aimed at ensuring will be required non-discriminatory access to natural monopoly services.

In the last quarter of the 20th century, in many countries, infrastructure industries containing natural monopoly components (electricity, gas, rail, water supply, telecommunications) underwent a radical transformation. The changes concerned the government regulation, as well as the structure industry and ownership. In different countries, both the approaches to reforming infrastructure industries and the forms and methods of their state regulation have significant differences due to the peculiarities of the model of the structure of national economies. Therefore, the problem of the most adequate regulatory mechanisms remains still topical.

According to the world experience of major power systems and power associations, minimization of costs for the development, production, transport and distribution of electricity can be achieved through various management schemes [27]. The key of them are: introduction of a centralized optimal management model within one vertically integrated energy company (the former USSR's EEC), application of coordinated optimal management with the presence of several energy companies (pools in the USA) and provision of a competitive market (England). The choice of the most suitable model of management depends on different factors. Thus, to a large extent, it is determined by the peculiarities of the infrastructure of the existing power systems, their functional properties and property relations.

The development of the main power grids plays a significant strategic importance in setting up a structural reform of the national energy market. The integration of the Integrated Power System of Ukraine (IPS) into the ENTSO-E pan-European energy system is provided for in the Association Agreement between Ukraine and the EU. Currently, part of the ECO is already functioning in synch with ENTSO-E. It is called the Burshtyn TES Island. However, there are some technical problems for synchronization of these power systems which require urgent attention over more detailed analysis and elimination in the near future.

Furthermore, the improvement of reliability and balance of the functioning of the IPS of Ukraine, the efficiency of energy resources use, as well as a significant increase in exports and restructuring of import transactions, should be noted among the advantages of the development of trunk and interstate power networks concerning the major ways of ensuring energy security of Ukraine.

Thus, the export of electricity from Ukraine increased by 998 million kWh and amounted to 6.165 billion kWh in 2018. Compared to 2017, the increase in exports in 2018 was 19.3%. The main steel exporters are Hungary (58.3%), Poland (22.9%), Slovakia (2.7%) and Moldova (15.5%) [28].

Electricity imports for the supply of dead ends amounted to 30.6 million kWh in 2018.

The export-import operations as a structural component of the entire electricity market are formed with regard to the «tariff for electricity» factor. A comparison of electricity prices for end consumers in both Ukraine and a number of other countries shows that the electricity tariffs in Ukraine are low enough (Table 2). Thus, the largest gap in prices is observed when compared with Germany (14% for households and 48% for businesses). In contrast, the smallest gap is with Belarus (56% for households and 83% for businesses). It means further opportunities for export growth.

In addition to comparing the price level by consumer groups the analysis of tariff rates for periods related to peak and non-peak loads in terms of electricity consumption is of particular interest. For instance, the price for the day was USD 0.0721 per kWh and USD 0.0463 per kWh in Estonia in July 2019. In Ukraine, in the same period, the prices were USD 0.815 per kWh during the day and USD 0.038 per kWh during the night.

The outcome of the electric power market reform in Ukraine demonstrates markets of electric energy in the country which have been launched since July 2019:

- the market of bilateral contracts;
- the day-ahead market;
- the intra-day market;
- the balancing market.

The purpose of the reforming of the electricity market in Ukraine is to ensure competitive mechanisms of the energy market functioning in order to create appropriate conditions for a transparent choice of counterparties and to allow the end-user to freely choose the supplier of electricity [28].

Table 2:
Electricity prices for households in different European countries as of March 2019

Country	Electricity prices (kWh, USD)	
	For households	For businesses
Ukraine	***0.05***	***0.10***
Belarus	0.09	0.12
Bulgaria	0.13	0.12
Hungary	0.13	0.13
Estonia	0.17	0.10
Romania	0.17	0.12
Poland	0.17	0.15
Slovakia	0.18	0.16
Latvia	0.18	0.14
France	0.19	0.13
Greece	0.19	0.13
Austria	0.22	0.17
Italy	0.26	0.22
Belgium	0.32	0.13
Danmark	0.34	0.27
Germany	0.35	0.21

Source: Complied by the authors based on [29]

Pricing in these markets is constructed as follows. The market of bilateral contracts provides for contractual prices for certain electric power lots which are fixed between the seller and the buyer of the given goods.

During the current period boundary prices for electric energy in the day-ahead market are established taking into account day and night zones. The maximum price in the daytime hours which falls right into the period from 9 to 23 o'clock. It is UAH 2,048.23 per MWh (USD 81.5 per MWh at the exchange rate of USD 0.0398 per 1 UAH). Regarding the hours falling on night time of the day, namely from the 1st to the 8th and 24th hours, the boundary price is UAH 959.12 per MWh (USD 38.2 per MWh at the exchange rate of USD 0.0398 per UAH 1).

Prices on the intra-day market vary about 15% of the marginal prices that operate on the day-ahead market.

The balancing market can be characterized as the most attractive in terms of price formation. The main reason for this is the point that this market is the only market where certain amounts of electric energy are purchased or sold according to the actual consumption of electricity by all consumers throughout the country's energy system. Therefore, in this work, the balancing market of Ukraine is chosen for analysis of the level and dynamics of price changes.

To this end, a sample of the actual prices on the balancing market was established in each estimated period in July [28]. According to the legislation, the estimated period is one hour. In addition, the average values for each day of the month are calculated separately for the zone «night» (mid N) and for the zone «day» (mid D).

The correlation analysis has shown a strong and, in some cases, a moderate relationship between the prices of a particular zone and the corresponding average. It should be noted that the data of the «night» group are characterized by higher correlation coefficient (0.67 and higher) (Figure 3) than the data of the «day» group (about 0.6) (Figure 4). The 24th hour is an exception. It has a fairly low correlation coefficient. In this case, it can be argued that all the parameters of the model affect the resulting indicator. It can be evidenced by the obtained value of the p-value which does not exceed the normative limit of 0.05 (Figure 5 and Figure 6).

Analyzing the results of the regression analysis, we noted the high regression coefficients for both the «night» and the «day» data. In addition, the Stdandard Error of the Estimate is higher for the «day» data (Figure 7 and Figure 8).

Correlations (Spredsheet1)
Marked correlations are significant at $p < .05000$
$N = 31$ (Casewise deletion of missing data)

Variable	Var24	Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8
mid N	0.071522	0.674979	0.825659	0.812591	0.921124	0.883723	0.822555	0.792652	0.750499

Figure 3:
Correlation results for the «night» data
Source: Compiled by the authors with the use of STATISTICA 10

The error distribution polygon for the mid N and mid D measures indicates a normal distribution (Figure 9).

Correlations (Spredsheet1)
Marked correlations are significant at $p < .05000$
$N = 31$ (Casewise deletion of missing data)

Variable	Var9	Var10	Var11	Var12	Var13	Var14	Var15	Var16	Var17	Var18	Var19	Var20	Var21	Var22	Var23
mid D	0.57328	0.40893	0.61650	0.68214	0.72238	0.77003	0.82297	0.76509	0.76509	0.67568	0.54865	0.79525	0.72669	0.60707	0.49664

Figure 4:
Correlation results for the «day» data
Source: Compiled by the authors with the use of STATISTICA 10

Regression Summary for Dependent Variable: mid N (Spreadsheet1)
$R = 1.00000000$ $R^2 = 1.00000000$ Adjusted $R^2 = 1.00000000$
$F(9.21) = 99999$, $p < 0.0000$ Std.Error of estimate: .00000

$N = 31$	b*	Std.Err. of b*	b	Std.Err. of b	t(21)	p-value
Intercept			0.000000	0.000004	-0	0.999999
Var1	0.141278	0.000000	0.111111	0.000000	60111732	0.000000
Var2	0.139707	0.000000	0.111111	0.000000	44479864	0.000000
Var3	0.127282	0.000000	0.111111	0.000000	34206421	0.000000
Var4	0.144801	0.000000	0.111111	0.000000	35116428	0.000000
Var5	0.171809	0.000000	0.111111	0.000000	48413068	0.000000
Var6	0.184481	0.000000	0.111111	0.000000	54898645	0.000000
Var7	0.161305	0.000000	0.111111	0.000000	56859012	0.000000
Var8	0.155015	0.000000	0.111111	0.000000	46877575	0.000000
Var24	0.065817	0.000000	0.111111	0.000000	32737009	0.000000

Figure 5:
Regression results for the «night» data
Source: Compiled by the authors with the use of STATISTICA 10

Regression Summary for Dependent Variable: mid D (Spreadsheet1)
$R = 1.00000000$ $R^2 = 1.00000000$ Adjusted $R^2 = 1.00000000$
$F(15.15) = 607E13$, $p < 0.0000$ Std.Error of estimate: .00000

$N = 31$	b*	Std.Err. of b*	b	Std.Err. of b	t(21)	p-value
Intercept			0.000000	0.000008	0	1.000000
Var9	0.107724	0.000000	0.066667	0.000000	14968267	0.000000
Var10	0.115970	0.000000	0.066667	0.000000	14187538	0.000000
Var11	0.104555	0.000000	0.066667	0.000000	12550314	0.000000
Var12	0.086389	0.000000	0.066667	0.000000	9022189	0.000000
Var13	0.091479	0.000000	0.066667	0.000000	6343653	0.000000
Var14	0.096354	0.000000	0.066667	0.000000	6267632	0.000000
Var15	0.102716	0.000000	0.066667	0.000000	9488448	0.000000
Var16	0.087599	0.000000	0.066667	0.000000	10448166	0.000000
Var17	0.096846	0.000000	0.066667	0.000000	12846298	0.000000
Var18	0.106817	0.000000	0.066667	0.000000	7722889	0.000000
Var19	0.106034	0.000000	0.066667	0.000000	14468132	0.000000
Var20	0.109824	0.000000	0.066667	0.000000	8674024	0.000000
Var21	0.104832	0.000000	0.066667	0.000000	17075357	0.000000
Var22	0.097805	0.000000	0.066667	0.000000	14044613	0.000000
Var23	0.09388	0.000000	0.066667	0.000000	14072220	0.000000

Figure 6:
Regression results for the «day» data
Source: Compiled by the authors with the use of STATISTICA 10

Statistics	Summary Statistics; DV: mid N (Spreadsheet 1) Value
Multiply R	1
Multiply R^2	1
Adjusted R^2	1
F (9.21)	99999
p	0
Std.Err. of Estimate	0.000000580522429

Figure 7:
Summary statistics for the «night» data

Statistics	Summary Statistics; DV: mid D (Spreadsheet 1) Value
Multiply R	1.00000E+00
Multiply R^2	1.00000E+00
Adjusted R^2	1.00000E-00
F (15.15)	6.068008E+15
p	0.000000E-01
Std.Err. of Estimate	3.001035E-06

Figure 8:
Summary statistics for the «day» data

Source: Compiled by the authors with the use of STATISTICA 10

The correlation analysis suggests that it is appropriate to focus on average values, which are closely related to hourly prices on the balancing market, for the forecasting process of indicative prices in different zones. In this case, the scope of functioning of the remaining markets operating in the current electricity system remains important for the study.

The process of reforming the electric power market is influenced by uncertainties. They raise the question of the need to clarify the development strategy and program, determine the necessary

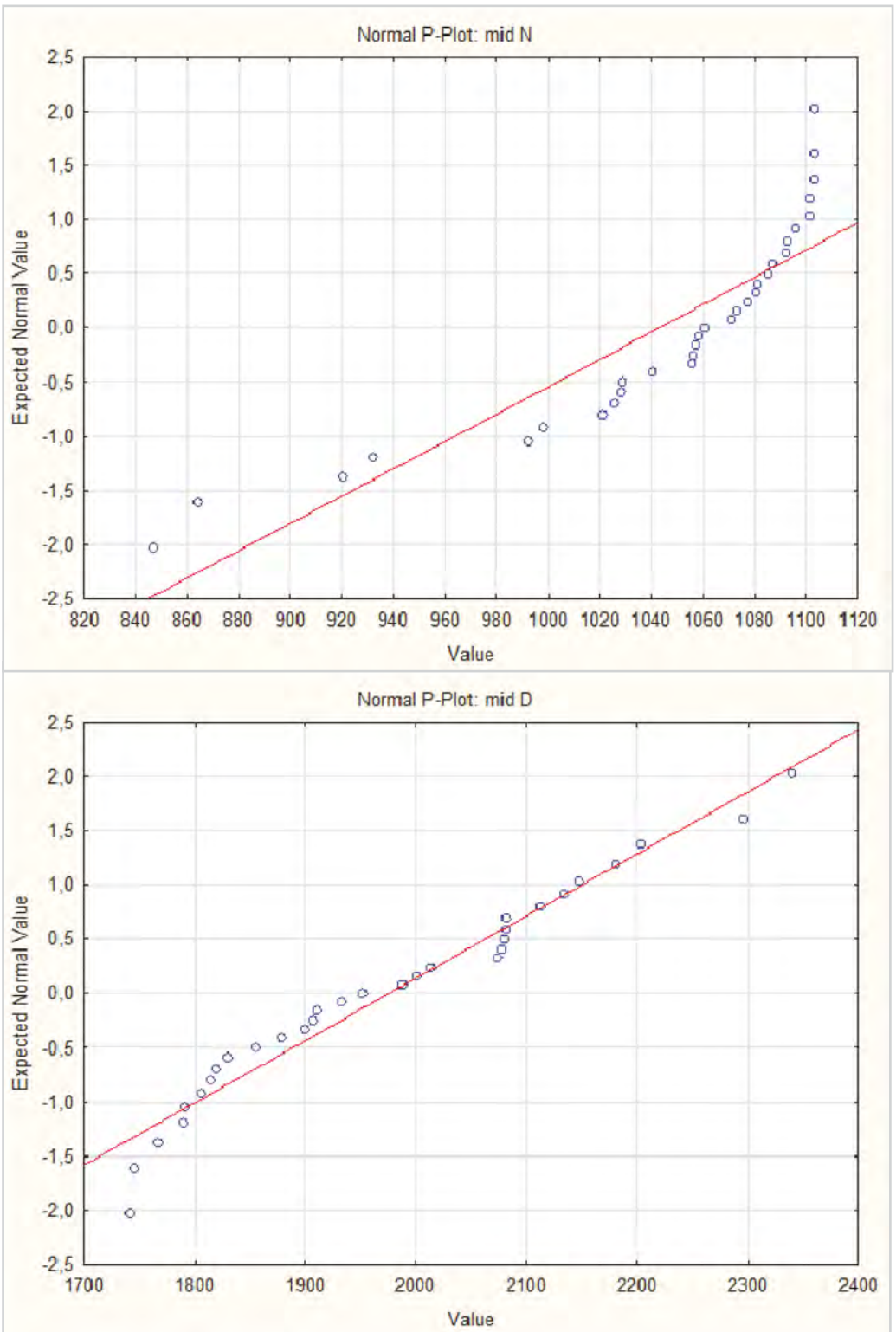

Figure 9:
Normal probability plots for the «night» and the «day» data
Source: Compiled by the authors with the use of STATISTICA 10

volumes and sources of investment, which, in turn, requires the development of economic mechanisms for attracting foreign investment in accordance with the state's investment policy in the electric power industry. In order to identify in a timely manner the shortages of generating capacity in electricity, make the necessary investment decisions to prevent them and reduce the risks of the functioning of electricity and power markets, industry-wide programs and projections for the development of electric power should be developed within the framework of the state system of demand and supply forecasting of electric energy (capacity), which is impossible without systematic forecasting of its development for both medium and long term.

The accelerated implementation of structural changes in the context of reforms without a detailed, comprehensive discussion of the expected consequences can lead both to discrediting the very idea of reforms and to negative consequences in terms of ensuring stability, security and investment attractiveness of electric power. And this is not only from the point of view of summary effects, but also from the point of view of their distribution among individual groups of the population, economic entities In this connection, the details of the considered issues are an important condition for assessing the expected benefits and costs of the reform, as well as their distribution among the various groups of stakeholders.

6. Conclusions

The importance of the activities of infrastructure industries, as well as the significance of their regulation by the state, is caused by their key place in the economy of the country and their major role in ensuring the well-being of the population. According to the retrospective analysis of the development of theoretical approaches to the application of the state regulation of infrastructure industries it was revealed that the infrastructure sector in general and the electricity sector in particular are perceived either as a natural monopoly subject to strict state regulation or as a competitive sector of the economy subject to deregulation. These theoretical concepts transform not only during the development of the market, but also depending on the political, economic and technological changes taking place worldwide. The essence of institutional and structural reforms in electricity markets across countries support the argument that there is no «right» way to reform. Consequently, attempts to calculate or justify the optimal structure of the industry, the number of generating companies, wholesale markets, the size of market entities are, in fact, sufficiently subjective predictions about what structure of the industry in the future best corresponds to what happened in the past.

Furthermore, an overview of the lessons that can be gleaned from the experience with electricity restructuring gives evidence to consider restructuring electricity markets not identical with deregulation.

Thus, according to the calculation results of the reforming of the electricity market in Ukraine the dependence of average values of hourly price formation on the balancing market, which is the most attractive for analysis of price policy volatility in this sector, has been revealed. Based on the division of the calculation period into «day» and «night» groups, the closer correlation between the average indicator and the price values in the night hours of the day has been proved. Consequently, the reform of the electricity market should be carried out in a holistic manner.

Pricing remains one of those aspects that links the functioning of various organized sectors in the electricity markets. Thus, reforming the system of tariff formation in one of these markets to some extent causes a response in another or several other markets. Reforming the energy market structural components should be comprehensively implemented in order to avoid fragmentary imbalances and the impact of price distortions on participants of the electricity market.

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