**Вісник Тернопільського національного технічного університету**
Scientific Journal of the Ternopil National Technical University
*2016, № 3 (83)*
*ISSN 1727-7108. Web: visnyk.tntu.edu.ua*

**UDC 662.6/.9**

# ANALYSIS OF THE FUEL AND ENERGY COMPLEX OF UKRAINE

**Andrii Kapustyanskyi; Gennady Varlamov**

*National Technical University of Ukraine «Kyiv Polytechnic Institute», Kyiv, Ukraine*

***Summary.*** *The authors analyzed the prospects and directions of these components industry that are based on analysis of specific performance of the fuel and energy complex of Ukraine in general and in particular the coal industry from 2010 to 2015, as well as major restructuring of legislation and public-private partnerships. The question of diversification of sources and routes of coal delivry and changing of the structure of energy balance by increasing of their share in solid energy under the context of energetical security was investigated. The changes in the structure of fuel consumption by thermal power plants due to temporary loss of control over the part of territory of Ukraine were studied and the main task to preserve the functionality of the coal industry was defined.*

***Key words****: fuel and energy complex, anthracite, coal, thermal power plant, boiler.*

*Received 01.08.2016*

**Problem setting.** Over the past 25 years of independence, organizational restructuring has become a constant factor in reforming the fuel and energy complex (FEC) of Ukraine, but instead of taking measures to reform the industry, such objects as thermal power plants (TPP), thermal power stations (TPS), coal mines and coal enrichment plants were becoming increasingly neglected, despite numerous state subsidies into powerful private entities. Loss of control over a large part of coal mining and thermal generation companies due to the armed conflict in the so-called Donetsk and Luhansk people's republics has furhter deteriorated solid-fuel power industry condition.

One of the key features of the TPPs design and functioning is their focus on local fuel field bases, with maximum burning efficiency due to the specific boiler equipment and optimizing fuel supply routes. During 2010-2013 domestic coal market was mostly balanced, and met power stations' requirements of solid fuel both in the amount and brands, but the loss of control over a part of the territory broke the equilibrium. Considering all these factors it can be stated that for its proper development the industry needs implementation of energy saving policy to reduce specific fuel consumption for the production of electricity and thermal energy to the corresponding levels of the US and EU, together with the substitution of natural gas and other expensive fuels used in thermal power plants of Ukraine with the energy coal of its own production [1].

**Analysis of the known research results**. Status and Strategy of the energy industry is constantly in the spotlight of experts in terms of improvement of energy and environmental efficiency, as well as diversification of fuel supply. Some issues related to the statistical characteristics of the energy industry in Ukraine are considered in the works of the following authors: L. Abalkina, J. Benko, A. Chervinska, Yu. Bazhal, A. Hal'chyns'kyi, V. Geyets, M. Herasymchuk, B. Stohniy, S. Kozachenko, V. Perebyjnis, A. Kovalenko, S. Yampolsky and others. Examples of tasks considered and the results obtained are given in [2-4].

However, despite the existing theoretical developments concerning the development of the domestic energy sector, topical issues of diversification of sources and routes of energy coal and changing the structure of energy balance by increasing their share of solid energy in the context of energy security remain unresolved.


*Corresponding author: Andrii Kapustyanskyi; e-mail: kapustyanskyy@gmail.com*

**Research Objectives.** Investigation of FEC of Ukraine condition over the past 5 years, the economic balance of power coal market between producers and consumers, changes in the structure of Ukrainian TPP fuel consumption due to the state's loss of control over part of its territory, and ways out of the situation.

**Statement of the material**. The question of the energy industry development in the economic context, implementation of fundamental reforms in the coal industry and opportunities for TPP transition to non-project Solid Fuel types (NSF) in the current situation requires a more detailed study of the dynamics and structure of the domestic fuel industry.

The basis of the power industry is the integrated power system (IPS) of the country, which provides electricity to domestic consumers and carries out its exports and imports. UPS has eight regional electric power systems connected by power lines, as well as interstate power lines. More than 1 million km of power lines are in operation [5].

In 2015, the actual amount of energy produced by power plants of Ukraine amounted to 157,634.8 million kWh, which is 24,310.2 million kWh, or 13.4% less than the amount produced in 2014. TPP in particular produced 49,386.3 million kWh, which is 19,083.2 million kWh or 27.9% less than in 2014. Meanwhile TPS produced 6,075.4 million kWh, which is 463.5 million kWh, or 7.1% less than in 2014. Nuclear power plants (NPP) produced 87,627.6 million kWh, which is 761.6 million kWh, or 0.9% less, compared to 2014. In 2015 hydroelectric power plants (HPP) and pumped-storage plants (PSP) produced 6,808.4 million kWh, which is 2,283.9 kWh or 25.1% less than their 2014 output. TPP and TPS output share in IPS in 2015 was in total 35.2%, whereas nuclear power generation and the general output of both HPP and PSP amounted to 55.6% and 4.3% respectively [6].

As we can see, the trend remains unchanged, i.e. the leading role in the energy sector belongs to nuclear and thermal power plants, but, if compared to 2010, in 2015 both TPP and TSP power generation decreased by 87,627.6 million kWh, thus falling by 28.9% (Table. 1). The decline in thermal energy is associated with the loss of control over part of the state territory, where the main deposits of AG/AC (Anthrazit Gestübbe / Anthracite chippings) coal rank, the rank, most of TPP ans TPS coal boilers designed for, are located, whereas the controlled part of the country has significant reserves of G (Gaskohle / Gas coal) and GF (Gasflammkohle / Gas flame coal) coal ranks.

**Table №1**

Dynamics and structure of electricity production in Ukraine for 2010-2015 years

| | 2010 | | 2013 | | 2015 | |
|---|---|---|---|---|---|---|
| | million kW/h | total production percentage | million kW/h | total production percentage | million kW/h | total production percentage |
| **Electricity production in Ukraine** | **187,899.3** | **100.0** | **193,563.4** | **100.0** | **157,634.8** | **100.0** |
| TPP and TPS | 77,977.3 | 41.5 | 86,579.5 | 44.7 | 55,461.7 | 35.2 |
| HPPand PSP | 12,952.5 | 6.9 | 14,215.2 | 7,3 | 6,808.4 | 4.3 |
| NPP | 89,151.4 | 47.4 | 83,209.4 | 43.0 | 87,627.6 | 55.6 |
| AES | 6.3 | | 1,247.0 | 0.6 | 1,591.1 | 1.0 |
| IGP and municipalTPS | 7,811.8 | 4.2 | 8,312.3 | 4.3 | 6,146.0 | 3.9 |

Please note that electricity production by isolated generating plants and other sources for 12 months of 2015 was 6,146.0 million kWh, which is 1,644.0 million kWh, or 21.1% less than in the corresponding period of 2014.

Alternative electricity sources (wind farms, solar power plants, biomass) for 12 months of 2015 amounted to 1,591.1 million KWh, which is 74 million KWh, or 4.4% less than in the corresponding period of 2014.

At the beginning of 2015 power plants had in stock the following amounts of fuel: coal – 1,457.9 ths. tons, oil – 112.1 ths. tons (at the beginning of 2014 4,246.6 ths. tons and 116.7 ths. tons respectively). The total amount of coal supply to power plants during January-December 2015 amounted to 29,984 ths. tons, which is 1,578.1 ths. tons less than in January-December 2014. Coal consumption amounted to 28,637.6 ths. tons. [6].

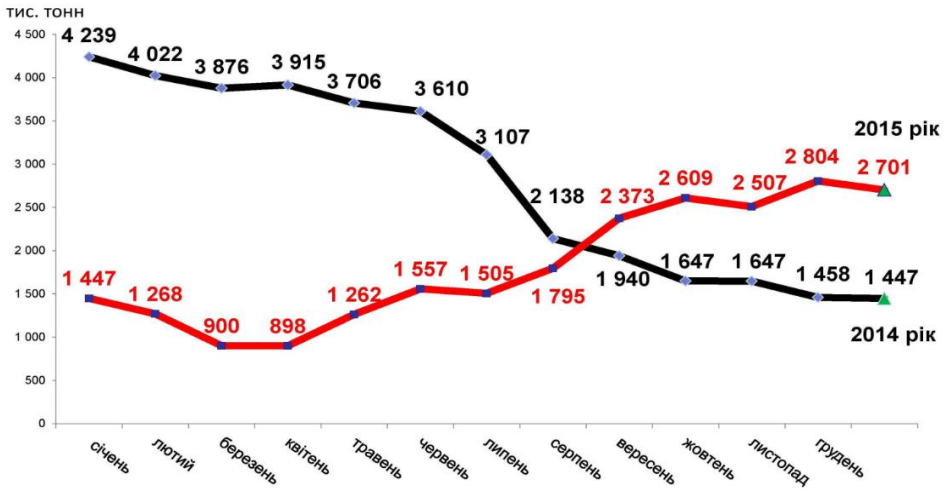


**Figure 1.** Dynamics of coal reserves at warehouses TPP and TCP 2014-2015 years

During the 2010-2013 domestic steam coal market was practically balanced, thus meeting thermal power plants' need for solid fuel and its distribution by its brands, as well as the amount and quality characteristics that allowed to abandon gas and black oil fuel "backlighting" and reduce the share of gas in thermal power plant fuel base to 2%, i.e. the costs of firing boilers. [7].

However, due to the outbreak of hostilities in eastern Ukraine and temporary loss of control over the mentioned territory there have been significant changes in the structure of TPP fuel supply, namely the lack of AG (Anthrazit Gestübbe) and M (Magerkohle / Nonbaking coal) coal ranks.

Significant reserves of G (Gaskohle) and GF (Gasflamkohle) coal ranks sa well as their production capacities still exist in controlled territory. In 2015 DTEK coal mines mainly provided "DTEK Energy" LTD power plants that use G coal with its own coal production.

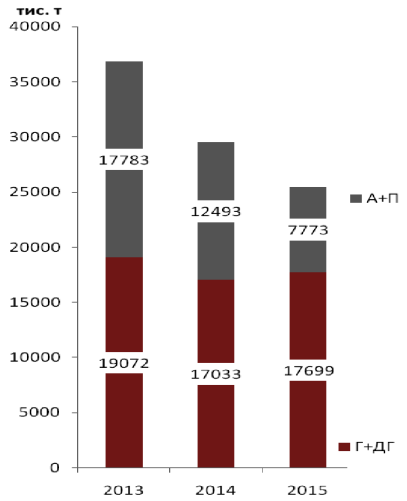


**Figure 2.** Annual deliveries to TPP grades of coal

Meanwhile state companies produced only 4.8 mln. tons of coal, although their capacities are significantly larger. The fact is that potential users of coal produced by public companies are only Vuhlehirsk thermal power plant (up to 2.6 mln. tons per year), and Cherkasy and Kalush TPS (up to 1.3 mln. tons per year) [8-9]. Restricting sales causes SOEs coal cost increase.

In 2015 the use of natural gas in thermal power plants and thermal power stations equalled to 4,332.1 million cubic meters, which is 648.9 million cubic meters less than in 2014. At the same time TPP of generating companies consumed 153.6 million cubic meters, which is 234.3 million cubic meters less than in 2014. FEC general performance statistics in 2012-2015 developed by the author using materials [10] are given in Table 2.

**Table № 2**

FEC general performance statisticsin 2010 – 2015

| Indicators | 2012 | 2013 | 2014 | 2015 | compared to 2014 | |
|---|---|---|---|---|---|---|
| | | | | | + / - | % |
| **ELECTRICITY** (millionkW/h) | | | | | | |
| production | 198 119,4 | 193 564,4 | 181 944,7 | 157 634,8 | -24 310,2 | 86,6 |
| export | 9 745,3 | 9 861,5 | 8 052,8 | 3 641,6 | -4 411,2 | 45,2 |
| consumption (net) | 150 720,1 | 147 264,4 | 134 653,0 | 118 726,9 | -15 926,1 | 88,2 |
| **COAL** (thousand ton) | | | | | | |
| production | 85 946,0 | 83 697,5 | 64 995,3 | 39 744,7 | -25 251,9 | 61,1 |
| including: – coking coal | 24 823,5 | 23 724,5 | 16 139,3 | 8 325,1 | -7 815,5 | 51,6 |
| – steam coal | 61 122,5 | 59 973,0 | 48 856,0 | 31 419,6 | -17 436,4 | 64,3 |
| consumption | 61 207,1 | 37 641,9 | 31 562,1 | 28 637,6 | -6 127,5 | 82,4 |
| **NATURAL GAS** (million. $m^3$) | | | | | | |
| production | 20 185,0 | 20 998,2 | 20 170,0 | 19 896,0 | -274,0 | 98,6 |
| including "Naftogaz Ukraine" NJSC | 18 206,9 | 18 663,2 | 16 855,0 | 16 032,0 | -823,0 | 95,1 |
| consumption | 54 774,6 | 50 357,6 | 42 465,0 | 33 727,0 | -8 738,0 | 79,4 |
| import | 32 939,3 | 27 974,4 | 19 466,0 | 16 454,0 | -3 012,0 | 84,5 |
| transit | 84 261,0 | 86 125,7 | 62 197,0 | 67 079,0 | 4 882,0 | 107,8 |

Last year events also had a significant negative impact on the performance of the coal industry. The point is that, firstly, a large number of the industry ended up in the territory not controlled by official authorities, namely in the area of anti-terrorist operations.

Thus, according to the Ministry of Energy and Coal Industry of Ukraine (Minenerhovuhillya) in 2015 249 state enterprises, institutions, organizations and associations under direct management of Minenerhovuhillya, and business partnerships where Minenerhovuhillya manages corporate rights of the state, were in the area of anti-terrorist operation [11-12] (ATO) (Table. 3), which is about 73% (Fig.), with 19% being part of the mine construction complex.

**Table № 3**

Structure of the coal industry companies, belonging to the management's branch Ministry of Energy and Coal Industry of Ukraine

| Enterprises | In Ukraine – controlled territory | In ATO area | Total in Ukraine |
|---|---|---|---|
| State enterprises, institutions, organizations and associations | 66 | 148 | 214 |
| Business associations for which Minenerhovuhillya has authority to manage corporate rights of state | 28 | 101 | 129 |
| Total | 94 | 249 | 343 |

It should be noted that out of 148 state enterprises, institutions, organizations and associations under the management of Minenerhovuhillya and located in ATO zone 55% are direct coal producers (80), which also provide the main coal mining in the public sector. In addition, among business associations, for which Minenerhovuhillya has authority to manage corporate rights of state are 46% of mine building enterprises and 80% of this amount, while those in the ATO zone are the main performers of construction work in the coal industry.

Consequently, the situation faced by the coal industry, managed by the Coal Ministry, in the ATO zone is unfavorable not only for the entire coal industry and energy independence of Ukraine, it also has a negative impact on related industries such as metallurgy and heat energy, not to mention the overall decline in industrial production and GDP.

In support of the above-mentioned Fig. 3 presents an analysis of coal production for the period of 1991-2015 by category (coking coal, steam (power) coal), and you can observe the dynamics of its production in 1991-2015.

As shown in Fig. 3, the total coal production in 2013 decreased compared to 2012 only 2.62%, while in real terms the decrease in production of both coking and thermal coal was almost identical. As for 2014, due to fighting in the Donetsk and Lugansk regions industry losses reached 22.34%, with the greatest damage occurred to coking coal production, which declined by almost a third, despite the fact that the volume of thermal coal production declined slightly less than 20%. In 2015 coal mining enterprises of Ukraine produced 39.7 million tons of coal, whish is 25,251.9 ths. tons (or 38.9%) less than in the corresponding period of 2014. Overall production of thermal coal was 31.4 million tons, it decreased by 17,436.4 tons (or 35.7%), while coking coal production was 8.3 million tons, dropping by 7,815.5 tons (or 48.4%).

During 12 months of 2015 coal mining enterprises, subordinated to Minenerhovuhillya of Ukraine, produced 6.7 million tons of coal, which is 9,863.5 thousand tons (or 59.4%) less than in the period of 2014. Production of energy coal decreased by 7,212.9 thousand tons (or 60.1%) compared with the corresponding period in 2014, and that of coking coal – by 2,650.6 thousand tons (or 57.6%), thus stopping at 4.8 and 2.0 million tons respectively.

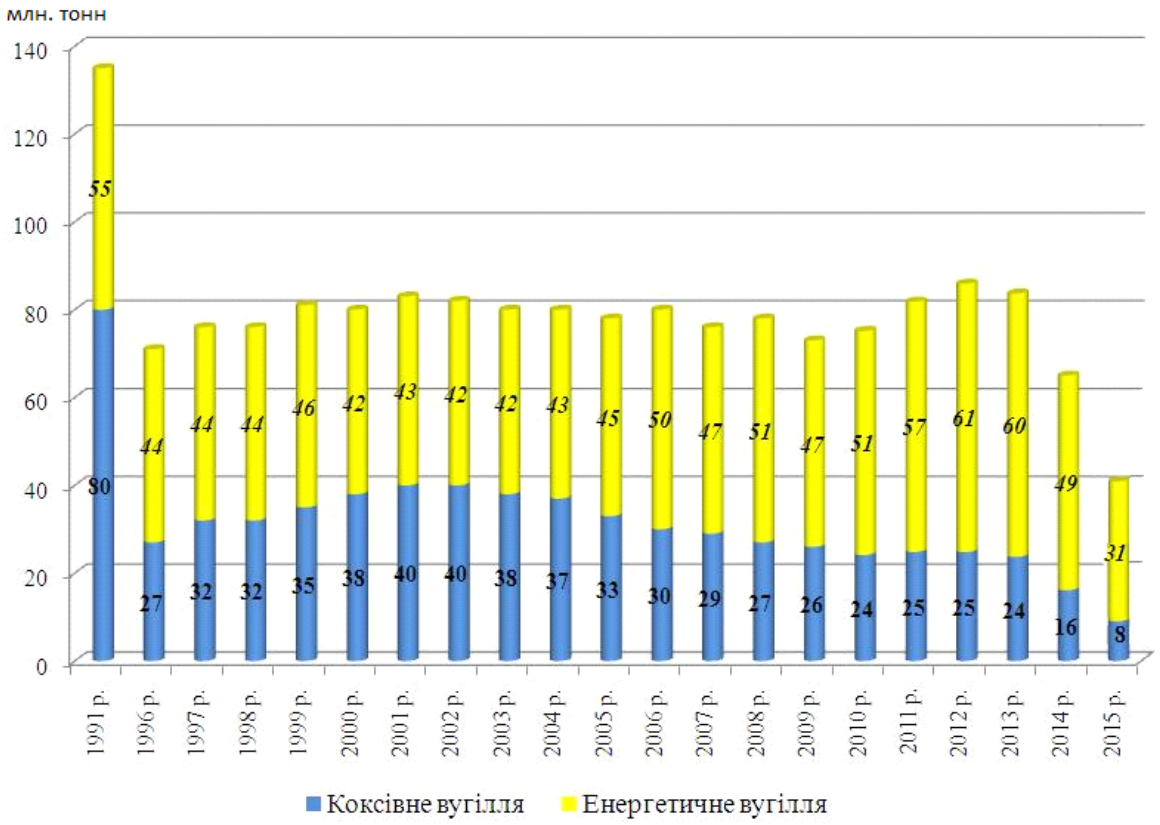


**Figure 3.** Coking and thermal coal extraction dynamics in Ukraine for 1991-2015. [6, 17]

It should also be notedthat the issue of liberalization of the coal market and mechanisms of marketing and pricing remains one of the most acute. At the present time relationship in the market coal are formed under the mediation of "Coal of Ukraine" state enterprise that does not directly develop relations between producers and consumers. Overall, without the transition to a competitive coal market continued government support seems hopeless because every year it needs more and more money to cover the expenses on the net cost, production facilities support and more.

In addition, the present functioning of the coal market in Ukraine is significantly complicated due to ATO in major coal producing regions. Thus, only 8 out of 24 coal mining companies, partners of "Coal of Ukraine" state enterprise in Donetsk and Luhansk regions are located on the territory controlled by Ukraine ("Pivdennodonbaske 1" CE, "Krasnoarmijskvuhillya" SE, "Selydivvuhillya" SE, "Krasnolymanska" SE, "Dobropillyavuhillya" SE, "Dzerzhynskvuhillya" SE, "Shakhta Novodzerzhynska" JSC, "Lysychanskvuhillya" JSC), which prevents normal functioning of the coal market. [13].

Considering all sources of financing in January-December 2015 energy sector enterprises managed by Minenerhovuhillya Ukraine utilized 15,220,200,000 UAH capital investments, which is 3.5% more, if compared with the corresponding period of the previous year [10, 14-16].

The capacity factor for the 12 months of 2015, compared to the same period of the previous year, decreased by 5.9% and is 22.3%.

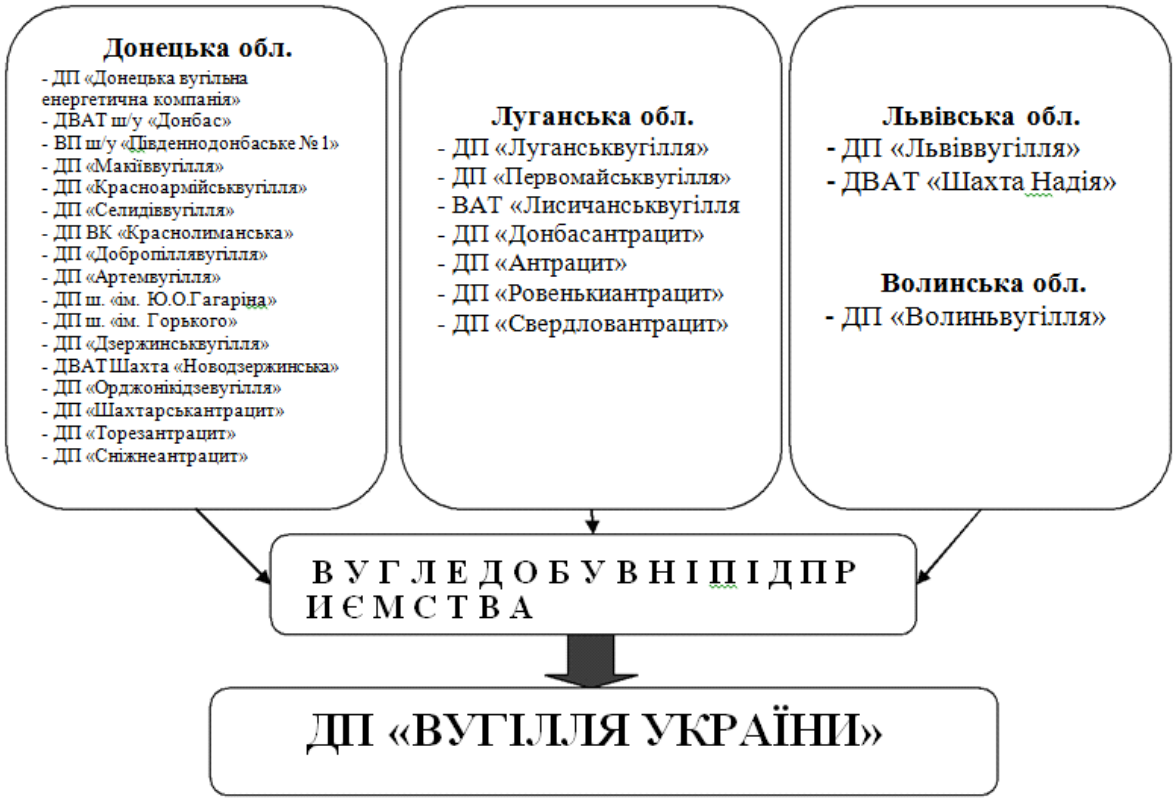


**Figure 4.** The system of market relations in Ukraine coal industry

During the reporting period 200 MW units have demonstrated the highest capacity factor, which is 34.7% (40.7% in the previous year). 150 MW units capacity factor is 33.9% (41.2% in 2014), 100 MW – 27.2% (36.6% in 2014), 250 MW – 25.4% (24.3% in the previous year) 300 MW – 21,8% (30.6% in 2014).

The following generating companies show decreased capacity factor: "DTEK Vostokenergo" LTD dropped by 9.2%, "Centrenergo" PJSC by 6.1%, "DTEK Dniproenergo" PJSC by 9.1%, "DTEK Zakhidenergo" PJSC by 0.1%. Meanwhile "Donbasenergo" PJSC boasts 3.3% capacity factor increase.

The specific consumption of equivalent fuel for electricity by thermal power plants of generating companies in Ukraine for 12 months of 2015 went up to 400.1 g/kWh, which is 4.9 g/kWh more than in the corresponding period of 2014 (395.2 g/kWh).

The specific consumption of equivalent fuel for electricity in Ukrainian thermal power plants (generating companies TPP and TPS) egualled to 389.6 g/kWh for 12 months of 2015, which is more in comparison with the corresponding period in 2014 by 2.3 g/kWh.

The current level of concentration of pollutants in thermal power plants of Ukraine and the requirements of Directive 2001/80/EC and Directive 2010/75/EU (at 6% O2) [18] demonstrate the inadequacy of emission standards (Table 4). Solid particles, SO2 sulfur dioxide and NOx nitrogen oxides pollutants concentrations excess reaches up to 30-125 times, 10-35 times, and 2,5-9 times respectively.

The level of concentration of pollutants in thermal power plants of Ukraine and total gross emissions of pollutants in coal thermal power plants call for urgent measures to reduce these emissions. Order of the Ministry of Environment of 22.10.2008. Number 541 "On approval of the technological standards of permissible pollutant emissions from thermal power plants, with more than 50 MW rated thermal capacity" provides for emission reductions in thermal power plants of Ukraine through the construction of new power units with a net

efficiency of above 42% or reconstruction of existing power units with increased efficiency to 38% and by implementing new flue gas cleaning technologies [19-20].

**Table № 4**

The current level of concentration of pollutants in thermal power plants of Ukraine and the requirements of Directive 2001/80/EC and Directive 2010/75/EU (6% $O_2$).[18]

| Pollutant | Current state, $mg/nm^3$ | Directive 2001/80/EC, $mg/nm^3$ | Directive 2010/75/EU, $mg/nm^3$ |
|---|---|---|---|
| **Solid particles** | | 50 | 20 |
| Electrostatic filters | | | |
| Precipitating electrode< 12 m | 600-2500 | | |
| Precipitating electrode> 12 m | 250-2100 | | |
| Venturi wet ash collectors | 1100-3200 | | |
| **Sulfur dioxide $SO_2$** | 2000-7000 | 400 | 200 |
| **Nitrogen oxides $NO_X$** | 500-1800 | 200 | 200 |

**Conclusions and suggestions**. Since FEC Ukraine is the most important sector of the national economy, its reforming, aiming at creation of market economy, privatization and price liberalization, is a process of utmost responsibility.

In 2015, the actual amount of energy produced by power plants of Ukraine amounted to 157,634.8 million kWh, which is 24,310.2 million kWh, or 13.4% less than the amount produced in 2014. TPP in particular produced 49,386.3 million kWh, which is 19,083.2 million kWh or 27.9% less than in 2014. Meanwhile TPS produced 6,075.4 million kWh, which is 463.5 million kWh, or 7.1% less than in 2014.

Compared to 2010, in 2015 both TPP and TSP power generation decreased by 87,627.6 million kWh, thus falling by 28.9%. The decline in thermal energy is associated with the loss of control over part of the state territory, where the main deposits of AG/AC (Anthrazit Gestübbe / Anthracite chippings) coal rank are located.

Necessary conditions for the normal functioning of the steam coal market is the resumption of budget support of state-owned coal businesses with their subsequent privatization and removal of artificial restrictions on the purchase of Donetsk anthracite and lean coal extracted by Ukrainian enterprises.

The tasks of domestic thermal power are to learn to burn imported lean coal with characteristics that differ from the project in anthracite boilers and expand the scope of consumption of coal gas ("barter" with DTEK enterprises, introduction of coal mixes to be burnt in anthracite boilers, transfer of anthracite and black oil-gas boilers to gas coal).

Ways to reduce the negative impact of coal power engineering on the environment include measures to improve the energy efficiency of solid fuel through the construction of new power units with a net efficiency of above 42% or reconstruction of existing poer units with increased efficiency to 38%. A significant reduction of pollutant emissions (dust, sulfur dioxide, oxides of nitrogen) through the introduction of new flue gas cleaning technologies will improve the environmental situation.

For all the time of Ukraine's independence thermal power and coal industries find themselves in the most difficult situation, the solution of which is a key factor in the context of energy security.

**References**

1. Kapustianskyi A.O. Dynamika zminy yakosti tverdoho palyva, shcho nadkhodyt na TES. Mizhnarodna naukovo-tekhnichna konferentsiia “Problemy enerhozberezhennia ta shliakhy yikh vyrishennia”. Kharkiv,

kviten 2013 r. P. 131 – 135 [in Ukrainian].
2. Stohnii B.S., Kulyk M.M. Zahalni problemy ta dovhostrokovi perspektyvy rozvytku enerhetyky. Nauka ta innovatsii. 2006. Vol. 2. № 2. P. 5 – 18 [in Ukrainian].
3. Kovalenko O. Stan ta perspektyvy rozvytku palyvno-enerhetychnoho kompleksu v Ukraini. Halytskyi ekonomichnyi visnyk. T.: TNTU. 2015. Vol. 48. № 1. P. 18 – 25 [in Ukrainian].
4. Chervinska O.S., Hrytsyk A.Ya. Stan ta perspektyvy rozvytku pidpryiemstv naftohazovoho kompleksu Ukrainy / Naukovyi visnyk NLTU Ukrainy. 2014. Vol. 24.6. P. 300 – 307 [in Ukrainian].
5. Plan rozvytku Obiednanoi enerhetychnoi systemy (OES) Ukrainy na 2015-2024 Available at: http://www.ukrenergo.energy.gov.ua/Pages/ua/DetailsNew.aspx?nID=667 [in Ukrainian].
6. Ministerstvo enerhetyky ta vuhilnoi promyslovosti Ukrainy. Available at: http://mpe.kmu.gov.ua/ [in Ukrainian].
7. Haponych L.S. Korotka kharakterystyka suchasnoho stanu roboty TES Ukrainy / L.S. Haponych, L.S. Dunaievska, S.V. Yatskevych / Zb. tez dopovidei "Vuhilna teploenerhetyka: problemy reabilitatsii ta rozvytku". 2014. P. 79 – 82 [in Ukrainian].
8. "Priorytety ta vazheli modernizatsii vuhilnoi haluzi v Ukraini". Analitychna zapyska. A.V. Shevchenko, S.L. Vorobiov Available at: http://www.niss.gov.ua/articles/1495/ [in Ukrainian].
9. "Hibrydna viina v Skhidnii Yevropi. Nevoiennyi vymir. Enerhetychnyi komponent". Tsentr hlobalystyky "Stratehiia XXI", M. Honchar, A. Chubik, O. Ishchuk, 2024. Available at: http://geostrategy.org.ua [in Ukrainian].
10. Pro osnovni pokaznyky roboty palyvno-enerhetychnoho kompleksu za sichen-hruden 2015 roku: Informatsiino-analitychna dopovid. Naukovo-tekhnichna spilka enerhetykiv ta elektrotekhnikiv Ukrainy. – K.: Tsentr hromadskoho informuvannia z problem palyvno-enerhetychnoho kompleksu, 2016. № 503. 227 p.
11. Pro zakhody stabilizatsii sotsialno-ekonomichnoi sytuatsii u Donetskii ta Luhanskii oblastiakh: nakaz Ministerstva enerhetyky ta vuhilnoi promyslovosti Ukrainy vid 25.11.2014 r. № 841. Available at: http://mpe.kmu.gov.ua/minugol/control/uk/doccatalog/list?currDir=50043 [in Ukrainian].
12. Pro strukturnu perebudovu vuhilnoi promyslovosti: nakaz Prezydenta Ukrainy vid 07.02.1996 r. № 116/96/ Available at: http://zakon1.rada.gov.ua/laws/show/116/96.
13. Pobudovano za danymy: Partnery Pidpryiemstva. Available at: http://www.dpvu.com.ua/ [in Ukrainian].
14. Plan-hrafik reformuvannia vuhilnoi haluzi/ Available at: http://mpe.kmu.gov.ua/minugol/control/publish/article?art_id=244978870 [in Ukrainian].
15. Kontseptsiia reformuvannia vuhilnoi promyslovosti, skhvalena rozporiadzhenniam Kabinetu Ministriv Ukrainy vid 14.05.2008 № 737-r. Ofitsiinyi visnyk Ukrainy. 2008. № 37. P. 1244 [in Ukrainian].
16. Plan zakhodiv Minenerhovuhillia z vykonannia Prohramy diialnosti Kabinetu Ministriv Ukrainy ta Koalitsiinoi uhody. Available at: http://mpe.kmu.gov.ua/minugol/doccatalog/document?id=244978725 [in Ukrainian].
17. Enerhetychna Stratehiia Ukrainy na period do 2030 roku: rozporiadzhennia Kabinetu Ministriv Ukrainy vid 27.07.2013 r. № 1071. Available at: http://mpe.kmu.gov.ua/.
18. Volchyn I.A. Osoblyvosti dosiahnennia skorochennia vykydiv zabrudniuiuchykh rechovyn v teploenerhetytsi Ukrainy. I.A. Volchyn, O.F. Buliandra. Zb. tez dopovidei "Vuhilna teploenerhetyka: problemy reabilitatsii ta rozvytku". 2014. P. 92 – 94 [in Ukrainian].
19. Volchyn I.A. Pro Natsionalnyi plan skorochennia vykydiv. I.A. Volchyn, V.A. Rashchepkin. Zb. tez dopovidei "Vuhilna teploenerhetyka: problemy reabilitatsii ta rozvytku". 2014. P. 23 – 26 [in Ukrainian].
20. Cherniavskyi M.V. Rezultaty ta perspektyvy modernizatsii isnuiuchykh pylovuhilnykh enerhoblokiv TES Ukrainy. M.V. Cherniavskyi, O.F. Buliandra. Zb. Tez dopovidei "Vuhilna teploenerhetyka: problemy reabilitatsii ta rozvytku". 2014. P. 46 – 50 [in Ukrainian].

**Список використаної літератури:**

1. Капустянський, А.О. Динаміка зміни якості твердого палива, що надходить на ТЕС [Текст] / А.О. Капустянський // Міжнародна науково-технічна конференція «Проблеми енергозбереження та шляхи їх вирішення». – Харків. – 2013 р. – С. 131 – 135.
2. Стогній, Б.С. Загальні проблеми та довгострокові перспективи розвитку енергетики [Текст] / Б.С. Стогній, М.М. Кулик // Наука та інновації. – 2006. – Т 2.№ 2. – С. 5 – 18.
3. Коваленко, О. Стан та перспективи розвитку паливно-енергетичного комплексу в Україні [Текст] / О. Коваленко // Галицький економічний вісник. – Т.: ТНТУ. 2015. – Том 48. № 1. – С. 18 – 25.
4. Червінська, О.С. Стан та перспективи розвитку підприємств нафтогазового комплексу України [Текст] / О.С. Червінська А.Я. Грицик // Науковий вісник НЛТУ України. – 2014. – Вип. 24. 6. – С. 300 – 307.
5. План розвитку Об'єднаної енергетичної системи (ОЕС) України на 2015-2024 [Електронний ресурс]. – Режим доступу: http://www.ukrenergo.energy.gov.ua/Pages/ua/DetailsNew.aspx?nID=667.
6. Міністерство енергетики та вугільної промисловості України [Електронний ресурс]. – Режим доступу: http://mpe.kmu.gov.ua/.
7. Гапонич, Л.С. Коротка характеристика сучасного стану роботи ТЕС України [Текст] / Л.С. Гапонич,

Л.С. Дунаєвська, С.В. Яцкевич // Зб. тез доповідей «Вугільна теплоенергетика: проблеми реабілітації та розвитку». – 2014. – С. 79 – 82.
8. Пріоритети та важелі модернізації вугільної галузі в Україні. Аналітична записка. А.В. Шевченко, С.Л. Воробйов [Електронний ресурс]. – Режим доступу: http://www.niss.gov.ua/articles/1495/.
9. Гібридна війна в Східній Європі. Невоєнний вимір. Енергетичний компонент. Центр глобалистики «Стратегія XXI», М. Гончар, А. Чубік, О. Іщук, 2024 [Електронний ресурс]. – Режим доступу: http://geostrategy.org.ua.
10. Про основні показники роботи паливно-енергетичного комплексу за січень-грудень 2015 року: Інформаційно-аналітична доповідь / Науково-технічна спілка енергетиків та електротехніків України. – К.: Центр громадського інформування з проблем паливно-енергетичного комплексу, 2016. – № 503 227 с.
11. Про заходи стабілізації соціально-економічної ситуації у Донецькій та Луганській областях: наказ Міністерства енергетики та вугільної промисловості України від 25.11.2014 р. № 841 / Міністерство енергетики та вугільної промисловості України [Електронний ресурс]. – Режим доступу: http://mpe.kmu.gov.ua/minugol/control/uk/doccatalog/list?currDir=50043.
12. Про структурну перебудову вугільної промисловості: наказ Президента України від 07.02.1996 р. № 116/96 [Електронний ресурс]. – Режим доступу: http://zakon1.rada.gov.ua/laws/show/116/96.
13. Побудовано за даними: Партнери Підприємства [Електронний ресурс]. – Режим доступу: http://www.dpvu.com.ua/.
14. План-графік реформування вугільної галузі [Електронний ресурс]. – Режим доступу: http://mpe.kmu.gov.ua/minugol/control/publish/article?art_id=244978870.
15. Концепція реформування вугільної промисловості, схвалена розпорядженням Кабінету Міністрів України від 14.05.2008 № 737-р [Текст]// Офіційний вісник України. – 2008. – № 37. – Ст. 1244.
16. План заходів Міненерговугілля з виконання Програми діяльності Кабінету Міністрів України та Коаліційної угоди [Електронний ресурс]. – Режим доступу: http://mpe.kmu.gov.ua/minugol/doccatalog/document?id=244978725.
17. Енергетична Стратегія України на період до 2030 року: розпорядження Кабінету Міністрів України від 27.07.2013 р. № 1071 [Електронний ресурс]. – Режим доступу: http://mpe.kmu.gov.ua/.
18. Вольчин, І.А. Особливості досягнення скорочення викидів забруднюючих речовинв теплоенергетиці України [Текст]/ І.А. Вольчин, О.Ф. Буляндра // Зб. тез доповідей «Вугільна теплоенергетика: проблеми реабілітації та розвитку». – 2014. – С. 92 – 94.
19. Вольчин, І.А. Про Національний план скорочення викидів [Текст] / І.А. Вольчин, В.А. Ращепкін // Зб. тез доповідей «Вугільна теплоенергетика: проблеми реабілітації та розвитку». – 2014. – С. 23 – 26.
20. Чернявський, М.В. Результати та перспективи модернізації існуючих пиловугільних енергоблоків ТЕС України [Текст] / М.В. Чернявський, О.Ф. Буляндра // Зб. Тез доповідей «Вугільна теплоенергетика: проблеми реабілітації та розвитку». – 2014. – С. 46 – 50.

**УДК 662.6/.9**

# АНАЛІЗ ДІЯЛЬНОСТІ ПАЛИВНО-ЕНЕРГЕТИЧНОГО КОМПЛЕКСУ УКРАЇНИ

**Андрій Капустянський; Геннадій Варламов**

*Національний технічний університет України «Київський політехнічний інститут», Київ, Україна*

***Резюме.*** *На основі аналізу характерних показників діяльності паливно-енергетичного комплексу України в цілому та вугільної промисловості зокрема з 2010 до 2015 р., основних законодавчих актів з реструктуризації та державно-приватного партнерства проаналізовано стан, перспективи та напрямки розвитку вказаних складових галузі. Розглянуто питання диверсифікації джерел та маршрутів постачання енергетичного вугілля та зміни структури паливно-енергетичного балансу завдяки збільшенню частки власних твердопаливних енергоресурсів у контексті енергетичної безпеки держави. Досліджено зміни в структурі паливоспоживання тепловими електростанціями внаслідок тимчасової втрати контролю над частиною території України та визначено основні завдання для збереження функціональності вугільної галузі.*

***Ключові слова:*** *паливно-енергетичний комплекс, антрацит, вугілля, теплова електростанція, котел.*

*Отримано 01.08.2016*