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Prospects for Ukraine's steam coal industry – high time for reform

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Prospects for Ukraine's steam coal industry – high time for reform

Executive Summary

Steam coal has always been a central pillar of Ukraine's energy mix. In the light of the recent gas crises, the importance of steam coal for national energy security has increased even further. However, the steam coal sector so far operates predominantly under direct state control in a planned economy environment. In particular, output volumes and prices are determined administratively. As a consequence, permanent state interventions and strict administrative management created an ailing steam coal sector. Ukrainian coal mines are loss making, despite huge annual transfers and subsidies from the central budget. At the same time they suffer from very low productivity levels and belongs to the world's most dangerous mines. Nevertheless, prices at which Coal of Ukraine sells steam coal to state-owned power generating companies – the almost exclusive usage of steam coal in Ukraine – are more than 60% higher than those of private mines. In turn, this pricing scheme reduces margins in power generation and undermines the investment capacity of power generators.

The current sorry state of the Ukrainian steam coal sector contrasts sharply with the solid global prospects of steam coal. However, the future use of steam coal requires huge investments in more efficient thermal power generation technologies to address the increasing environmental concerns. In Ukraine, this need for investment is even greater because of the depleted capital stock of its thermal power generating companies.

Obviously, price levels for steam coal determine overall economic viability of the coal-electricity value chain. Pricing a crucial input such as steam coal within its value chain is not a trivial task. Since too high or too low prices benefit different players at the expense of others, it is unlikely that an administrative solution can fully balance all economic potentials and shortcomings. Competitive market forces are much better suited to balance supply and demand of steam coal while considering the need for electricity generators to invest in new capacities as well as the potentials of the mining industry to increase efficiency.

Hence, we conclude that the sustainable development of Ukraine's steam coal sector demands the liberalisation of the wholesale electricity as well as of the steam coal market. Generally, this requires the abolition of all price interventions as well as the privatisation of electricity generating and coal mining companies. However, to ensure proper success of this reform and to avoid negative consequences, the sequence of reforms should be such that first, market liberalisation creates business opportunities. Only afterwards, property rights should be sold to private operators while the concrete design of privatisation laws needs to ensure that too high levels of ownership concentration are not possible.

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1. Introduction

Ukraine has a long and proud tradition of coal mining. The country dispose of the world's seventh largest proven coal reserves which – given current production volumes – could last for more then 300 years. About half of total coal production and even more than half of total reserves is steam coal, which is used to fuel electricity generation. This fuel has always been a central pillar of Ukraine's energy mix. In the light of the recent gas crises, the importance of steam coal for national energy security has increased even further. However, the steam coal sector so far operates under direct state control in a planned economy environment. In particular, output volumes and prices as well as steam coal prices for power generating companies are determined administratively. As a consequence, permanent state interventions and strict administrative management has created a mismanaged and ailing steam coal sector. Despite huge annual transfers and subsidies from the central budget and the social insurance system, Ukrainian coal mines are loss making, suffer from very low productivity levels and belong to the world's most dangerous mines.

In this paper we analyse the current situation and future prospects for Ukraine's steam coal industry. In general, an economically viable steam coal sector would be in the highest interest of Ukraine. A strong share of coal fired electricity generation in Ukraine's energy mix would reduce Ukraine dependency on energy imports. It could also cushion Ukraine from external shocks resulting from volatile world market prices for gas and oil. Given this objective and based on an initial assessment of the current problems in Ukraine's steam coal sector, this paper provides policy recommendations to ensure an economically viable long-term development of the Ukrainian coal sector.

2. Current Structure of Steam coal industry[1]

2.1 Reserves and production

Ukraine has 33.873 million tons of proven coal reserves. This are the seventh largest coal reserves in the world. Steam coal and cocking coal account for about 48 % of Ukraine's coal reserves.

Although coal extraction continued to decline from the Soviet production levels, Ukraine is still one of the ten largest coal producers in the world. In 2008, steam coal production in Ukraine even surged to new production records (see Table 1). This hike was triggered by a strong demand for steam coal by thermal power plants in order to substitute imported natural gas in power generation. Additional demand was created by the government which accumulated a state coal reserve. This trend continued in 2009. Already during the first nine months of 2009 exceeded the steam coal production the annual average production levels of the period 2004-2007. In 2008 and 2009, steam coal accounted for more than 80% of total coal extraction.

[1] The information provided in this section is based on GAG (2003), GAG (2008), Concorde Capital (2006), INTERNATIONAL ENERGY AGENCY (2006) as well as on insights obtained in interviews with the Ukrainian Ministry of Coal Industry, the Ukrainian Ministry of Fuel and Energy, the Ukrainian Ministry of Economy, the National Electricity Regulatory Commission of Ukraine and the company Coal of Ukraine during a fact finding mission in Kiev in November 2009.

Table 1:

Coal extraction in Ukraine

	1991	1996	2000	2004	2005	2006	2007	2008	9м 2009
Energy coal, mt	80,3	44,3	41,8	34,0	31,9	35,0	32,4	51,0	34,3
Total coal (incl. coke and steam coal), mt	135,6	57,0	62,4	59,4	60,4	61,7	58,9	59,5	40,9
Steam coal as share of total, %	59,2	77,7	67,0	57,2	52,8	56,7	55,0	85,7	83,6

Source: The Ministry of Fuel and Energy

Steam coal extraction in Ukraine is dominated by mines which are fully or majority-owned by the state (henceforth state-controlled mines). Together, these mines accounted for about 69% of total production in 2008 (see Table 2). During the first nine months of 2009 their combined share declined to 65%. The remaining share of slightly more than 30% is almost entirely produced by four mining companies, which are all under private majority ownership and control. These companies are further integrated into industrial holdings, one of which also controls one of the five thermal power generation companies[2] or 20% of the coal fired power generation capacity in Ukraine. In both, the state-owned and private sector, steam coal production is highly concentrated. Overall, the five largest private and the five largest state owned companies account for an estimated 70% of total output.

Table 2:

Steam Coal extraction by state and private coal mines

in thousand tons	2008	%	9M2009	%
State-controlled Mines	35,114	69	22,296	65
Private Mines	15,907	31	11,956	35
Total	**51,021**	**100**	**34,252**	**100**

Source: Energobusiness magazine

2.2 Structure of the Ukrainian steam coal industry

Ukraine's steam coal industry is largely dominated by the state. The Ministry of Coal Industry decides within its own planned production targets about the activities of all state-owned coal mines. Afterwards the state-controlled mines sell their production to the state-owned trading company *Coal of Ukraine*, a subsidiary of the Ministry of Coal Industry. The trading company *Coal of Ukraine* buys also coal from private operated mines and organizes the distribution of steam coal to power generators.

On the demand side, the state dominates the power generation as well. The Ministry of Fuel and Energy is in charge of the NJSC Energy Company of Ukraine, which operates the power generators DniproEnergo, DonbassEnergo, ZahidEnergo and CenterEnergo. Together, these companies operate roughly 80% of Ukraine's coal-fired generation capacity.

Coal prices are agreed upon in closed negotiations between the two Ministries. The price is oriented on the average productions costs of coal mines plus the marketing costs of

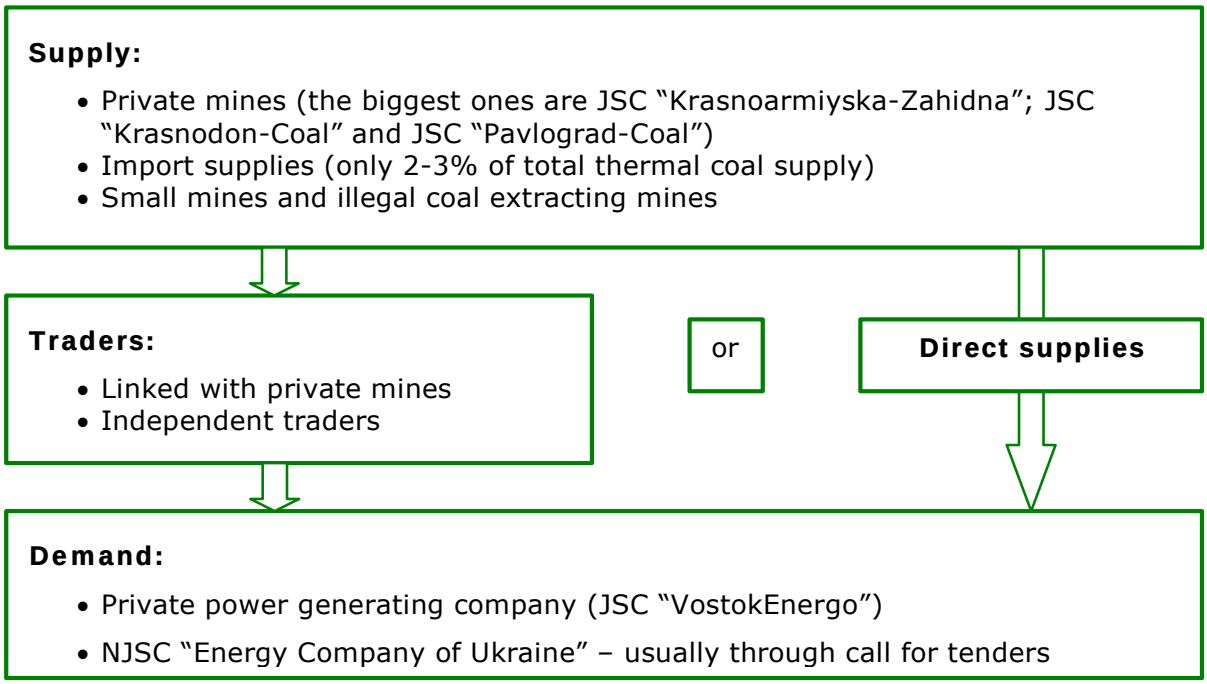
[2] Vostokenergo; the state-owned companies are Centrenergo, Dniproenergo, Donbasenergo and Zakhidenergo.

Coal of Ukraine. The state dominated chain of supply and demand for steam coal is often labelled in Ukrainian as the primary market.

The so called secondary market is dominated by private companies. It accounts for slightly more than 30% of Ukraine's steam coal production. Here, a number of private mines sells their production to private traders (mostly DTEK) or supply directly to power generators, in particular privately-owned VostokEnergo or the state holding Energy Company of Ukraine (see Figure 1). Price formation on the secondary market occurs either within vertically integrated structures or through the interaction of supply and demand.

Figure 1:

Structure of the secondary market for Steam Coal



Source: own drawing

2.3 Efficiency, prices and costs

Ukrainian steam coal is located in rather harsh and difficult geological conditions. The average mine depth is more than 700 metres, while approximately 20% of mines are located at deeps of 1.000-1.400 metres. Very thin and often steep coal beds make mechanised extraction costly and require special equipment. As a result of the specific natural conditions, Ukrainian steam coal cannot be traded internationally, because it is burdened by large shares of waste due to the thin layers and its ash and sulphur content is higher than what environmental regulations in many regions such as the European Union allow. Hence, most of the steam coal produced in Ukraine (>95%) cannot be exported.

Generally, the industry suffers from numerous problems. Most importantly, productivity levels are low by international standards. For example, in Ukraine 311.000 employees extracted a total of 58.9 m tons of coal or 189 tons per employee in 2007. In Poland, 117.000 employees produced 89,1 m tons of coal or 761 tons per employee (Saluga and Kicki 2008), which is more then four times the productivity level of Ukraine. In particular the state-owned mines produce at lower efficiency levels than private ones since they are generally overstaffed and use outdated equipment. Furthermore, working conditions in

coal mines are poor and security levels low, as frequent accidents demonstrate. Since 2005, almost 600 miners lost their life due to accidents at coal mines.

The prices, at which coal mines sell their output differ greatly between private- and state-owned mines. Generally, prices for state-owned mines are more than 60% higher than those for private mines:

Table 3:

Average Output Prices (for coking and steam coal) for different Coal Mines

UAH per tonne	1H 2008	9M 2008	2008	1Q 2009	7M 2009	9M 2009
Mintopenergo mines	487.0	447.5	453.9	442.3	444.1	441.9
JSC Lysychanskvugillya (state owned)	384.6	408.6	424.6	477.6	496.9	497.6
JSC Pavlogradvugillya (private)	281.1	269.4	262.1	234.3	251.1	270.0

Source: Energobusiness magazine

However, despite these higher price levels, state-owned mines fail to cover their full costs of operation. Even worse, average losses of state-owned mines have increased more than threefold since the beginning of 2008 (see Table 4). For private mines, the situation is more difficult to assess. One the one hand, average figures for the whole steam coal industry in Ukraine suggest losses of 155 UAH per tonne in 2008, which implies that losses of private mines are almost as high as for state-owned ones. On the other hand, private mines sell at substantially lower prices and are often part of vertically integrated supply chains. Hence, it is likely that owners generate value added in other stages of the supply chain while their coal mines report losses in order to qualify for state subsidies. Specific information on prices and costs of the largest private mining companies is not publicly available.

Table 4:

Average Prices for Steam Coal and Costs of Production for state-owned and operated mines (UAH/t)

	1H 2008	7M 2008	9M 2008	2008	1Q 2009	1H 2009	7M 2009	8M 2009	9M 2009
Prices	487	-	447	454	442	-	444	-	442
Costs	-	567	581	609	689	707	-	707	-
Losses	**-80**		**-134**	**-155**	**-247**	**-263**		**-265**	

Source: Energobisness

To support the coal industry, the Ukrainian government pays a number of subsidies and transfers, mainly to cover the costs of operations. From 2003 to 2008, this fiscal support has increased by almost three times to UAH 7.8 bn or – because of declining employment in coal mining – by 3.4 times to UAH 24,105 per employee. Due to the significant impact of the global economic crises on the Ukrainian economy and in particular upon request of the IMF, who provided a crucial loan to avoid insolvency of the government, the fiscal support to the coal industry has been dramatically reduced in 2009 and in the draft budget for 2010.

Table 5:

Fiscal support to the Ukrainian coal industry

in UAH bn	2003	2004	2005	2006	2007	2008	2009 (plan)	2010 (project)
Cost covering, capital transfers	1.9	2.9	2.3	3.1	4.5	6.4	2.6	1.0
Restructuring	0.6	0.7	0.8	0.8	0.8	0.7	0.6	0.3
Other	-	-	-	0.4	0.5	0.5	0.3	0.3
Total	**2.6**	**3.6**	**3.1**	**4.3**	**5.8**	**7.5**	**3.6**	**1.6**
Total per employee (UAH)	**7,123**	**10,557**	**9,394**	**13,201**	**18,502**	**24,105***	**11,471***	**5,251***

** Estimation based on number of employees as of 2007*

Source: Treasury reports, Law "On State budget for the year 2009", Draft law on the State Budget for 2010, IER calculations

2.4 Power generation

In Ukraine, coal is the dominating fuel for thermal power generation. About 80% of the thermal power generation capacity is coal-fired. Consequently, the strong increase in gas import prices since 2005 has been mirrored by a strong shift in fuel consumption away from gas. By 2009, coal accounts for roughly 99% of total fuel consumption by thermal power plants.

Table 6:

Fuel consumption by thermal power plants (GWh, period to period)

	2004	2005	2006	2007	2008	3M2009	6M2009	9M2009
Steam coal	144.1	160.4	187.9	185.3	200.4	44.4	81.1	125.2
Natural gas	102.1	36.3	22.1	27.6	15.5	0.1	0.4	1.8
Total	**246.2**	**196.7**	**210.0**	**212.8**	**215.9**	**44.5**	**81.5**	**126.9**
Share of coal	*59%*	*82%*	*89%*	*87%*	*93%*	*100%*	*100%*	*99%*

Source: Energobiznes, own calculations

More than 90% of the steam coal consumed by power plants stems from domestic production.[3] By and large, Ukrainian steam coal is no substitute for internationally tradable coal.[4] Consequently, steam coal prices in Ukraine are not necessarily following world market developments. Up until 2005, Ukrainian coal has been a rather cheap fuel for power generators. Since then, in line with the increased demand for steam coal, the Ministry of Coal Industry had raised prices until early 2008 in order to achieve parity with international price levels (see Figure 2). Only afterwards, prices were not further adjusted despite a dramatic price hike by the end of 2008. Since the outbreak of the global economic crises, international steam coal prices are decreasing and getting closer again to the price level in Ukraine.

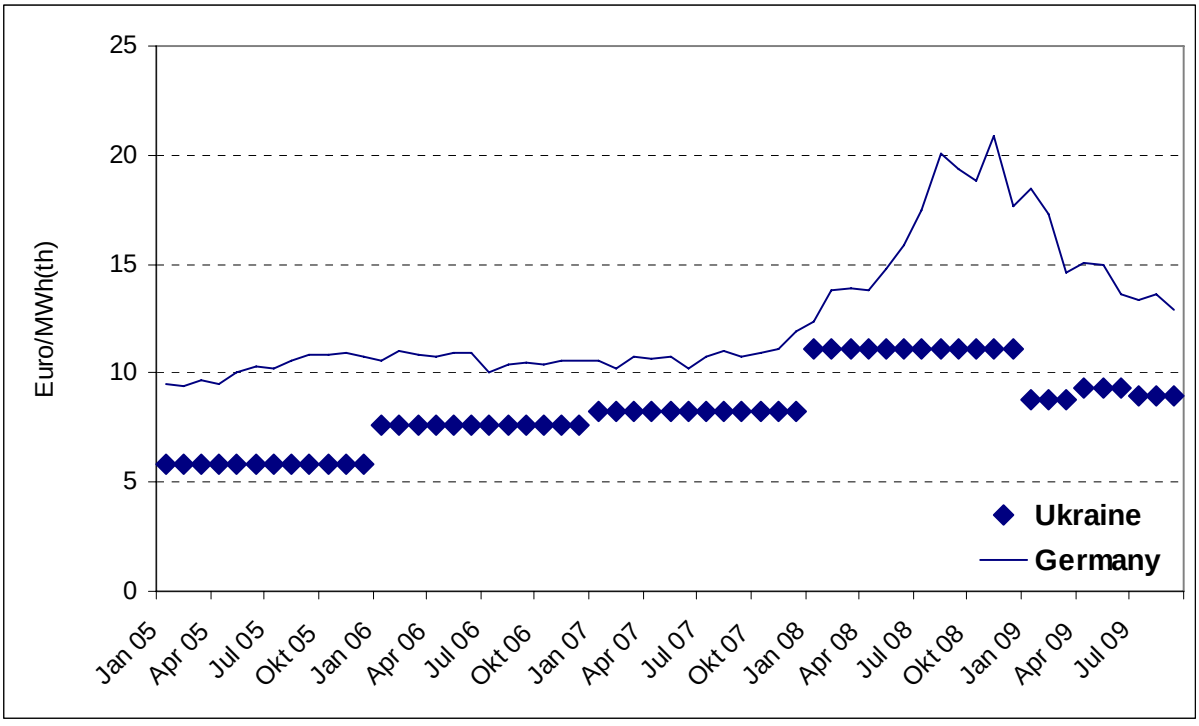
[3] Almost all imports originate from Russia and contain a special quality segment (IEA 2008b).

[4] In 2007, the ten largest coal-exporting countries were Indonesia, Australia, Russia, Columbia, South Africa, China, Vietnam, USA, Kazakhstan, Poland (IEA 2008b).

While the price increase since 2005 was intended to benefit the coal mining industry, it has proven to be a strong burden for power generation companies because it erased the possibility to cover the relevant costs of power generation. For example, fuel costs of 579 UAH/t of coal (or 100.6 UAH/MWh of thermal energy) in the first quarter of 2009 translate – at an efficiency level of 29% – into fuel costs of 100.6/29% = 347 UAH/MWh_{el}. Given average wholesale electricity prices in April 2009 of 392 UAH/MWh,[5] this implies a surplus of only 45 UAH/MWh or 12% of the average electricity price. While this might be sufficient to cover the operational expenses for labour etc., it does not allow covering even a part of capital costs, which are estimated at a minimum of 165 UAH/MWh (15 Euro/MWh) for the modernisation of existing coal-fired capacity.[6] Hence, the increase in coal prices since 2005 has fully eroded the possibilities for state-owned thermal power generators in Ukraine to invest in the modernisation of its generation capacity. In fact, the existing capacity of the four state-owned generation companies has been operating for between 30 and 45 years, long beyond its respective design life times, and no significant modernisation of new investment project has been initiated during the past 10 years.

Figure 2:

Coal prices in Ukraine and Germany (in Euro per MWh_{th})



Ukraine: annual average price for TPPs / Germany: average import price
Source: Energobiznes, Energate

This situation is different for the privately-owned generation company Vostokenergo, which has recently undertaken several modernisation projects. Also, the company does not receive steam coal from the state-owned coal supplier *Coal of Ukraine*. Rather, it is part of a vertically integrated industrial holding and receives its coal supplies from own

[5] In April 2009, average prices as shown on www.nerc.gov.ua were at 494 UAH/MWh_{el} in peak and 144 UAH/MWh_{el} in off-peak hours.

[6] The estimate is based on own assessments of power plant modernisation projects in Ukraine.

mining companies at lower prices. In fact, subtracting capital costs of 165 UAH/MWh and other operational expenses (except fuel costs) of 45 UAH/MWh from the average wholesale market price of 392 UAH/MWh leaves maximum fuel costs of 182 UAH/MWh. Assuming an efficiency level of 30% this corresponds to coal prices of 53 UAH/MWh_{th} or 305 UAH/t of coal. This in turn is consistent with the prices of private mines as shown in Table 3 (the difference might reflect transportation costs).

Overall, these calculations suggest that while state-owned power generation companies suffer from high fuel costs which do not allow financing any investments, the price structure on the secondary market seems to be more economically viable, as it allows power generation companies to finance investments.

3. Prospects for steam coal in Ukraine

In general, coal continues to be a widely available, flexible and competitive energy fuel. Therefore, coal will certainly play an important role in the future energy mix on a global level. According to the International Energy Agency (2008a), global coal-based electricity is expected to rise from 7,756 TWh in 2006 to 11,100 TWh by 2015 and to almost 14 600 TWh by 2030. Most of the growth will take place in non-OECD countries, which will generate over two-thirds of all coal-fired electricity in 2030, compared with less than half now. Coal's share of total electricity generation increases from 41% in 2006 to 44% in 2015 and remains broadly at this level through to 2030. Nevertheless, the future prospects of coal also depend on how two important challenges can be addressed:

- First, established coal-fired generation technologies suffer from rather low levels of energy efficiency of about 35% or even less.
- Second, coal combustion causes a number of environmental concerns such as emissions of Greenhouse Gases as well as NOx and SO_4.

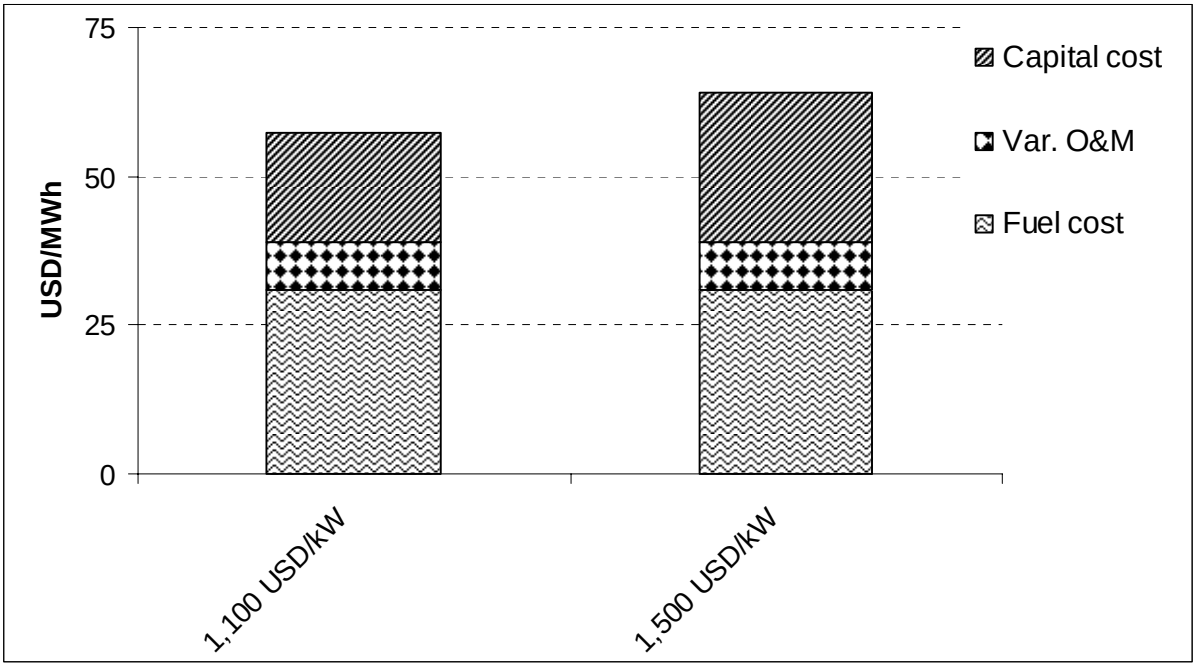
New technologies address both problems. Modern coal-fired plants use pulverised coal combustion (PCC) with supercritical (very high pressure and temperature) steam turbine cycles. These technologies achieve efficiency levels of 45% and more and produce significantly less emissions than all previous technologies. Already today, such technologies are available for a large range of coal types at reasonable investment costs of between 1,100 and 1,800 USD/kW (International Energy Agency 2007). Moreover, specific technologies to further reduce carbon emissions from coal-fired power generation such as the carbon capture and storage (CCS) technology are currently developed in many countries. Once this technology will be available for implementation, it will be possible to reduce CO_2 emissions of coal-fired plants to almost zero.

Ukraine is in the favourable situation to be blessed with large coal reserves. Given the recent hikes in gas prices and the political costs that a high dependency on energy imports might incur, it is obvious that coal should play an important role in Ukraine's future energy mix, in particular for power generation. But, coal-fired power generation is not a low-cost technology. Although fuel costs are relatively moderate, capital costs are higher than e.g. for gas-fired plants. Hence, future prospects of coal-fired power generation depend crucially on the respective conditions for large scale investments. While this is generally a global concern, it is particularly relevant for Ukraine, where technology is largely depleted since all existing power plants have outlived their design life times. In fact, replacing 10 GW or about half of the existing coal-fired capacity by state-of-the-art technology will require investments of about USD 11 bn to 15 bn. While this sounds dramatic, such investment can be repaid over a considerably long period of about 40 years. In fact, investment calculations on the basis of current fuel prices reveal that covering the full costs of this investment require average wholesale market prices of between 60 and 65 USD/MWh (450 and 500 UAH/MWh, see Figure 3). In fact, given that average wholesale market prices have reached almost 400 UAH/MWh in the second

quarter of 2009, this appears to be a rather realistic price level. In other words, the need to modernise or replace existing capacities can be expected to push electricity prices further up, in particular once prices are fully determined by market forces after the current regime of the wholesale electricity market will be reformed as planned by the Cabinet of Ministers.[7] An additional factor pressing for new investments is Ukraine's potential to benefit from international financial support for investments to reduce Greenhouse Gas emissions.

Figure 3:

Long-run marginal costs of coal-fired power generation for alternative costs per kW of installed capacity



For 1000MW units, lifetime 40 years, availability factor 85%, WACC=9.6%, coal=75USD/t

Source: own calculations, based on IEA 2007 (see GAG 2007)

Against this background, securing the role of steam coal in Ukraine by renewing Ukraine's power generation capacity seems to be feasible. However, as the above calculations for the present situation in section two demonstrate, the final outcome is sensitive to the pricing of steam coal. In fact, the intervention by *Coal of Ukraine* aimed at setting coal prices so as to cover the costs of all operating mines increases the price of Ukrainian steam coal beyond its marginal value within the power generation system. As a result, power generators cannot cover capital costs and thus, are unable to invest or even finance the rehabilitation of their outdated technology. At the same time, the coal mining sector lacks proper incentives to restructure and produce more efficiently. Instead, generous subsidies even support further inefficiencies.

[7] Presently, the wholesale electricity market resembles a single-buyer structure. In theory, this structure is sufficient to stimulate competition. In practise, however, a number of institutional shortcomings such as low payment discipline and lack of privatisation, as well as frequent interventions by public authorities limit competition levels. Hence, an inter-agency commission with all relevant stakeholders already decided in 2002 to shift market structure towards a bilateral contracts model, which has become the standard concept in energy markets of EU members.

Hence, what is necessary to overcome the current deadlock situation with outdated and depleted generation technology as well as loss-making coal mines is liberalisation of both, the wholesale electricity as well as the steam coal market. In this way, electricity generators will be free to choose quantities and prices at which they supply electricity subject only to actual demand. In turn, a competitive fuel market for steam coal will ensure that Ukrainian steam coal is valued properly while unreasonable price support to coal mines with all negative impact on efficiency levels is avoided. Moreover, recent technological advances offer promising opportunities for Ukrainian coal mines. For example, coal gas can be extracted to generate electricity. In this way, coal mines could reduce their own electricity costs and, possibly, even sell electricity. However, utilising theses opportunities again requires substantial investments which a state-owned sector is unlikely to manage – in particular if it is struggling with loss-making operations and low efficiency levels, as is the case for Ukraine's coal industry.

In addition to the liberalisation of the steam coal sector, the Ukrainian government needs to ease the social costs that temporarily occur with shedding of redundant labour. The case of Poland provides some insights for Ukraine.[8] Poland faced similar problems with respect to its coal sector. In 1990 the Polish coal mining sector produced 147.9 mt of coal and employed about 388.000 miners. By 2007 the production of coal had fallen to 89,1 mt of coal and the number of miners was reduced to 117.000. In other words, while the output was reduced by 40%, employment shrank by 70%.

The government of Poland had accepted that coal sector restructuring would require a multi-year effort to continue and deepen the reforms. The adopted policies had a multi-faceted approach – covering employment restructuring, capacity liquidation and financial restructuring, as well as profound changes in the structure and management of the industry, including privatization. Policies fostered the development of alternative employment opportunities in mining regions and improved environmental protection standards.

The significant reduction in employment was achieved without major social unrest. This general lack of conflict was the result, first and foremost, of relatively generous severance packages provided to miners leaving work, based on individual arrangements. Accordingly, miners who have accepted a one-off severance payment in return for an undertaking never again to seek employment in the mining sector have received an average payment of PLN 50,000 (EUR 12,000).

In the next chapter we will outline the main steps that should be taken to achieve this objective.

4. Policy recommendations

The discussion in the previous section highlights the crucial importance of the steam coal in the coal-electricity value chain. Obviously, price levels for steam coal determine overall economic viability:

- Artificially high coal prices harm the electricity sector and limit the possibilities for power generating companies to invest in new capacities. Moreover, high coal prices also reduce the incentives for coal mines to increase efficiency and distort structural change, because also inefficient mines can operate and sell steam coal as long as prices are relatively high. Generous budget subsidies further aggravate this situation, since they even allow loss-making mining companies to continue operations without improving their performance.

[8] The following discussion on the Polish experience is based on Kaminski (2009), Saluga and Kicki (2008), Gardawski (2003) and Republic of Poland, MINISTRY OF ECONOMY.

- On the other hand, if coal prices are too low, electricity generators earn extra profits at the expense of coal mines. In this situation, which resembles the steam coal market of about 6-8 years ago (GAG 2003), the mining sector operates under stronger pressure than economically justified while the economy fails to secure the full economic value of its coal reserves. Worse, severe conditions for the mining industry give rise to strong rent-seeking activities which further increases the public costs caused by these distortions.

Pricing a crucial input such as steam coal within its value chain is not a trivial task. Since too high or too low prices benefit different players at the expense of others, it is unlikely that an administrative solution can fully balance all economic potentials and shortcomings. In fact, the numerous failures under the current administrative setting as described in section 2 of this paper can be seen as evidence for this hypothesis. With this in mind, it seems that competitive market forces are much better suited to balance supply and demand of steam coal while considering the need for electricity generators to invest in new capacities as well as the potentials of the mining industry to increase efficiency. Given that most of the steam coal produced in Ukraine is essentially a non-tradable good which is almost exclusively used for power generation, international coal prices are not necessarily a useful benchmark for domestic prices. Instead, vertical integration of power units and coal mines is a promising way to secure long-run plant operation and fuel deliveries, just as it is the case for other non-tradable types of coal such as lignite. Overall, the degree to which mines and electricity generators operate independently or within vertically integrated structures should also be determined by competitive market forces rather than by administrative design.

With this in mind, sustainable development of Ukraine's steam coal sector requires the liberalisation of the wholesale electricity as well as of the steam coal market. Generally, this requires the abolition of all price interventions as well as the privatisation of electricity generating and coal mining companies. However, to ensure proper success of this reform and to avoid negative consequences, the sequence of reforms should be such that first, market liberalisation creates business opportunities. Only afterwards, property rights should be sold to private operators while the concrete design of privatisation laws needs to ensure that too high levels of ownership concentration are not possible in order to secure proper competition in the steam coal market. .

Hence, we suggest the following agenda for reforms in this sector:

i) Liberalisation of the wholesale electricity market:

The first step should be the implementation of the long-planned shift of the wholesale market to a bilateral contracts regime. In this way, power generating companies will be given the possibility to freely choose their consumers and to compete with one another. The respective proposal has been developed in consultation with the relevant regulatory authority (NERC) and includes all relevant elements of such a market design, including a balancing market, procedures for self-scheduling of generation as well as a plan for the transition of the market from the present British-pool model towards this new regime. Implementing this reform is the first important step to improve the performance of the electricity sector.

ii) Liberalisation of the coal industry:

Once a functioning wholesale market for electricity is established, policy makers must focus attention on liberalising the fuel market for coal. This includes the following major steps:

- Corporate restructuring of all state-owned coal mines to create independent decision making units.

- Remove the obligation to sell the output through the state-owned trading company *Coal of Ukraine*. Instead, all coal mining companies should be free to choose their buyers and to supply generation companies based on bilateral contracts of their own chosen.
- Define a transition period of 3-5 years during which *Coal of Ukraine* continues to operate as a trading company and abolish the company thereafter.
- Initiate a restructuring programme for the mining industry which includes renaturation of closed mines, severance payments for coal miners who quit their work, support to local economic development etc.

iii) Privatisation of all power generation and coal mining companies

Once both markets have been liberalised, the state needs to privatise all of its assets in both sectors. When specifying the detailed privatisation procedure the impact on competition in both sectors deserves special attention. In particular, privatisation rules need to be sufficiently open to allow both, separate ownership of different assets as well as vertical integration of coal mines and generation companies in a single holding. At the same time, the rules need to foresee appropriate restrictions to avoid that a very small number of investors will be able to acquire all relevant assets.

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