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The Coal Industry in Southeast Europe (paying special attention to Bosnia and Herzegovina) in the Context of Restructuring of Energetics and the Protection of the Environment

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The Coal Industry in Southeast Europe (paying special attention to Bosnia and Herzegovina) in the Context of Restructuring of Energetics and the Protection of the Environment

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Abstract

It has been widely noticed in the wider region of Southeast Europe that there must exist a greater focus on a faster creation of a new creative and innovative regional energetic structure, which would enable this geopolitical region to incorporate into the energetic structure of the EU. Nonetheless, that would take a lot more time, as the many studies done by the international experts and institutions show. This issue is of a special interest to Bosnia and Herzegovina, a country with most probably the biggest coal reserves in the region and with possibly the biggest mining and energetic issues.

In the work presented here, this issue is being examined in a wider context of global developmental trends, in the context of process of restructuring not only of energetics, but also of the overall economy in the Southeast Europe, as well as in the context of the current process of rationalization of the European internal market of energents. Of course, the focus of this paper also covers the ecological problems following these processes.

Key words: coal industry, restructuring, Southeast Europe, Bosnia and Herzegovina (BiH), environment

Introduction

In the geopolitical region of Southeast Europe, the coal industry has a long tradition. The coal is being extracted mostly in order to produce electrical energy. As well as in some other coal regions, here too in the last few decades has come to a great crisis of a complex character, which is largely manifested in the coal production and the electro-energetics that comes out of it. First and foremost it appeared as a result of the developmental failures within the ruling political system and is manifested today in the political, economical, technological and ecological sense. The transition of the energetics is thus considered to be one of the hardest tasks in the complex process of transition of the economic structure in the Southeast Europe.

Today, some of the countries of this geopolitical region are ending this process while others are just about to begin it. Never the less, their goal is the same: a profitable business market.

1. Available Coal and Successive Electro-energetic Potentials in Southeast Europe

In the structure of the primary energy consumption in the region of Southeast Europe, dominate oil (Greece, Slovenia, Croatia), natural gas (Turkey, Romania), water sources (Albania) and of course coal (Bulgaria, Bosnia and Herzegovina, Serbia and Montenegro). Nonetheless, coal is still the dominating source of energy within the region and in some countries chances are good that it will stay that way for a long time. The dynamics of the coal production in Southeast Europe in the last decade has been as follows:

Table 1. Production of all kinds of coal in Southeast Europe

In millions of tons

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004 (estimate)
Albania	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BiH	2.1	1.1	4.1	5.1	4.1	5.1	5.1	9.1	8.3	8
Bulgaria	27.7	27.6	26.2	27.4	23	26.1	26	23.3	27.2	27.3
Croatia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0
Greece	57.7	59.8	58.9	60.9	61	64	68	70.5	68.3	68
Macedonia	7.3	7.1	7.4	8.1	7.3	7.5	8	7.6	7.5	7.5
Slovenia	4.5	4.5	4.9	4.9	4.8	5.8	4	4.7	4.7	5
Romania	41	41.9	33.9	26.2	22.7	27.3	33.3	30.4	34	33
SerbiaMont.	39.9	38.4	40.6	43.5	32.7	34	35	35.8	40.1	37
Turkey	55	56.3	59.9	67.4	67	63.3	65.9	61.2	61.2	61.2
Total	235.5	236.9	236.1	243.7	222.8	235.3	245.5	242.7	251.4	247.1

Source: *BP Statistical Review of World Energy 2004* (adapted)

It is noticeable that coal in the region of Southeast Europe is being extracted in significant quantities. When comparing the presented data with the world production of coal in the last decade, one can deduct that this region has produced 4.2-4.9% of the world coal production. When considering the specific countries one by one, the situation is of course very different.

According to the available data¹⁾, the **Albanian** production of coal in the last few decades has fallen from 2 Mt in the 1980's to 0.04 Mt at the end of 1990's. Regardless of the significant geological reserves (over 400 Mt) of black coal and lignite, the Albanian mines are characterized by high production costs, bad quality coal, and binding geological conditions. It has resulted in a shutdown of many mines; so the Albanian future in coal is questionable, expect for maybe some smaller facilities for production of electrical power.

1) *Restructuring and Privatizing the Coal Industries in Central and Eastern Europe and the CIS*, World Energy Council, 2000, p.71

The reserves of the lignite / black coal in **Bulgaria** are estimated to over 3 billion tons and they provide for over 40% of electrical power production. They are located mostly in the east (Maritza -East), central Bulgaria (Marbas) and the western part of the country (Chukurovo, Bobov Dol, Pernik, Beli Breg). The extraction of coal (of caloric power of 6-9000KJ/kg) is mostly done on surface mining sites while in the underground coalmining sites it is on a somewhat higher level (10-11500 KJ/kg). The finishing of the coal is being realized in the near-by thermoelectric power plants or in the ones significantly distant from the place of the coal extraction (for example Bobov Dol S.A. is getting coal supplies from mines that are 14 and 55 kilometers away). "Maritza –East", the biggest energy capacity in the country, is basically holding reserves estimated to around 2.4 billion tons of caloric power of 6300-6700 KJ/kg and is supplying coal (around 23 million tons/year) to three power plants of capacity of 2500 MW in its nearest surroundings and also to the only Bulgarian factory of wooden blocks (over 2.5 million tons/year), which is situated around 14 km away from it.

The coal production in **Croatia** has a long tradition, even though the reserves were never significantly large for the country as a whole, but only for the regional developmental plans (Istria). Due to the non-profitable reserves, all of the more significant Croatian mines have been closed in the last few decades. True, there is still a slight possibility for opening some mining locations for mining black coal and lignite if it proves to be profitable in the future. It should be mentioned that the Croatian Parliament has made a decision in 1999 that there should be no building or planning to build coal-based thermoelectric power plants or nuclear power plants, which should definitely have consequences for the coal industry in this country.

Greece, unlike the neighboring Albania, is a leading country in Europe as far as coal production is concerned. According to the available data²⁾, Greek coal industry is based on low calorie lignite, which provides for ¾ of the electrical power produced in the country. The Greek lignite coal is similar to the rest of the Balkan lignite and they are on a borderline between peat coal and black coal. They are mostly located (the 2/3 of the relatively more expensive production capacities) in northern Greece (the Ellasona-Ptolemais-Amandeon-Florina basin) and in the central Peloponnesian peninsula (the Megapolis basin with the cheaper exploitation). The extraction of the Greek coal (mainly in surface mines with over 4 billion tons of economic reserves) is almost entirely (except for a few smaller private companies) done by the public electrical power company, which provides the country with 50% of the needed electrical power by supplying over 20 thermoelectric plants with the capacity of about 5000 MW. The rest of the needs are met by exploiting natural gas (around 15%) and water energy (around 30%). Due to the lack of the so-called "transparency of the books", it is hard to assess the level of the possible government support to the Greek coalmining capacities today.

According to the newest information³⁾, the coal in **the Former Yugoslav Republic of Macedonia** makes up about 84% (2002) of its electrical power production (4% goes to oil and 12% to water sources). The four capacities in this country with the reserves of 0.7 billion tons are estimated to be able to satisfy current demand for coal (without subsidies) for the next 25 years. The electrical energy capacities (the biggest thermoelectric plant "Bitola") have mostly been restructured and are running a profitable business.

²⁾ *Le lignite en Europe*, Rheinbraun, 2000, p.11-12, 2) *IEA Statistics*, 2005

³⁾ *IEA Energy Statistics-Electricity*, 2005

The industrial coal reserves (mostly lignite) in **Romania** are estimated to approach 3 billion tons and are located in three zones: the sub-Carpathian depression, between rivers Olt and Danube (smaller amounts of stone coal and 90% of reserves of a lesser quality lignite 1700-2200 kcal/kg), in the depression near Carpathians between the rivers Olt and Buzan and in north-west Transylvania (a better quality lignite 1800-2800 Kcal/kg)⁴. The Romanian coal is mainly (around 75%) extracted from the surface mines and over 90% is used in the thermoelectric plants mostly distant from the location of extraction, except for the large thermo-electric plant in Rovinari (of 650 MW), which is located near the mines. In the last few years, in the 14 thermoelectric plants that run on burning lignite of capacity of around 6000 MW, provide for more than 35% of the country's needs for electrical power, and 90% of the total coal production (18 surface mines and 12 underground mines), are controlled by "The National Company of Lignite "Oltenia" S.A".

The coal production in **Slovenia** has dropped significantly in the last few decades: "From the record 6.8 million tons in the beginning of the 1980's, the production has dropped to 4.7 million tons in the year 2002 "⁵". According to the most recent research results (deducted from the visit to the Slovenian coal mines in March of 2005), currently, there is a trend of closing mining sites "Trbovlje-Hrastnik" (the last active mine of black coal in Slovenia). The only mine for which there are some long-term plans is the lignite mine "Velenje", in which modern buy-off methods and modern technologies are used and which would on a long term basis provide the thermoelectric plant "Shoshtan" with coal, while the plant in Trbovlje would import coal in the future.

The exploitable coal reserves, mostly lignite of caloric power of 7000-7400 KJ/kg in **Serbia and Montenegro** of estimated 13 billion tons are located in the five larger coal basins: Kolubara, Kostolac, Kosovo, Kovin and Pljevlja and they are mostly exploited in surface mines. The thermal energy capacities of around 5800 MW are mostly in the nearest vicinity from the coalmining sites. Of the totally estimated coal reserves, the 62% are in Kosovo, where surface mines "Belachevatz" and "Dobro Selo" provide with coal the thermal energy facilities "Kosovo A and B" of 1480 MW.

Turkey is considered to be one of the larger coal producers. The estimates show that the proven reserves of stone coal by the Black Sea coast are over a billion tons. This resource is relatively getting more expensive due to the growth of the extraction costs, so the overall production during the last few years has been stagnating, which calls for state subventions. The lignite reserves in Turkey are mostly of caloric power of around 2500 Kcal/kg and they amount to over 8 billion tons, and in the biggest coherent basin Asfin-Elbistan (40% of total reserves of Turkish lignite) in central Turkey, the lignite of better quality is extracted (of around 4400 KJ/kg). Unlike stone coal, the Turkish production of lignite (mostly from surface mines) has grown significantly in the last few decades and has been done within the "TKI" and "Asfin-Elbistan" companies and a small number of private firms.

Regardless of the significant availability of all conventional resources, the domestic coal production in Turkey does not cover even 50% of its needs for primary energy. The biggest coal based thermal energy capacities are located close to the mining sites (8400 MWh by Asfin-Elbistana, 3900 MWh by Seyitomer etc.) and they

⁴ See further; D.Fodor, G.Baica, A.Florea, *Preoccupation for Increasing The Economic Efficiency of Mining The Lignite Deposit from Romania*, The Second International Conference on Coal Opencast Exploitation, *Coal 01*, Belgrade, 2001, p.517-525

⁵ *Nacionalni energetska program*, Ministarstvo za okolje, prostor in energijo, Ljubljana, 2003, p.56

are not sufficient for satisfying the growing needs for electrical power. Besides, the presence of a large amount of sulfur and gas in Turkish lignite results in the corresponding ecological problems, so in the process of building new and rebuilding the existing thermoelectric power plants based on coal, there will be a need for significant funds, considering the growing needs for thermal energy, which is demanded by the expansive economic growth in the country for the past few years. The current projects⁶⁾ regard the construction of a TE plant of 1300 MW dependant on the imported coal near Iskenderun and a TE plant (1400 MW running on domestic lignite) in the region of Afsin-Elbistan, which would increase the use of coal in the country for around 23 million tons.

2. The Intensity of the Hitherto Restructuring and the Possible Directions of the Future Restructuring of the Coal Industry and of the Electro-energetics in Southeast of Europe

According to the recent data⁷⁾, around 40% of the total production of electrical power in Southeast Europe comes from coal (2002) and the rest comes from the water sources (23%), natural gas (20%), nuclear power (9%), oil (7%) etc. The coal industry in these countries has been marked with high growth rates up to the beginning of the transition, when the situation started to change significantly. The fall of energetics has been especially evident in Bosnia and Herzegovina due to war (1992-1995) and in Serbia and Montenegro due to NATO bombings (1999).

In the other important coal-producing countries of the region of Southeast Europe, the coalmining is in the process of adjustment to the European integrations, which can be seen from the relevant data⁸⁾. According to this data, the coal production in Bulgaria in the 1980's has been continuously growing from 29.2 Mt (1981) to 36.8 Mt (1987), after which there has been a two years long drop to around 34 Mt. In the 1990's, the Bulgarian production of coal has continued to drop and it has stopped at the level of an average of 29 Mt per year, just to get stable again in the years 2000 to an average of 27 Mt per year where in the year 2003, it has amounted to around 0.5% of the world production. A similar case can be seen in Romania where the production has grown from 36.9 Mt/year (1981) to peak with 61.3 Mt/year (1989) just to drop again at the beginning of the transitional period to 38.2 Mt/year (1990). In 1990's, the coal production in Romania has been oscillating between 23 Mt/year (1999) and 42 Mt (1996) in order to stabilize in the 2000's at the average of around 33 Mt/year, which represents 0.6% of the world production. During the observed period, the coal production in Greece has been almost constantly increasing from 27.3 Mt/year (1981) to 51.9 Mt/year (1989), to 64 Mt/year (1990), in order to peak at the level of 73 Mt/year (1.5% of the world production) in the year 2002. In Turkey, the production of coal during this period grows as well but with some smaller oscillations from 21 Mt (1981) to 68 Mt/year (2001), followed by a drop to 54,4 Mt (2002) and further to 49,3 Mt (2003), which amounts to around 1% of the world production.

⁶⁾ EIA, *International Energy Outlook 2004*, p.87

⁷⁾ IEA-*Energy Statistics-Electricity 2005*

⁸⁾ For example: *BP Statistical Review of World Energy, 2004*

Relevant facts⁹⁾ based on geological and engineering information point out some evident reserves of coal (mostly lignite) in these countries, especially in Turkey and Greece (0.4% or 0.3% of the total world reserves in 2003).

As far as the electrical energy is concerned, it is also varying in these countries in the correlation with the intensity of the transitional processes. According to afore mentioned source, in some of these countries the transition of the energetics (measured with brut output) was easily noticeable. Just for the illustration's sake, the consumption of electric energy in Bulgaria during the period between 1990 and 2000, has been balancing at the level of an average of 40TWh/year with significant variations (a drop in the period between 1992 and 1994 to an average of around 38 TWh per year) and in the 2000's, there is an evident growth peaking at 44 TWh/year (in 2003, 2.6% of the world production). In Romania, in the period between 1990 and 2003, the production of electrical power has also been varying from the maximum 64 TWh (1990) to 51 TWh (1999), after which there was a slight move up to 57 TWh, or 2.9% of the world production (2003).

Unlike the above-mentioned countries, the production of electric energy in Turkey has been continuously growing from 58 TWh (1990) to 141 TWh (6.6% of the world production (2003), while the production growth in Greece has been somewhat smaller from 35 TWh (1990) to 55 TWh (2003).

It seems that in the beginning of the 2000's, the electro-energetic flows in the region of Southeast Europe have started to somewhat stabilize and move toward the orientational frames from the following table:

Table 2. The Electro-energetic Balance in Southeast Europe Sorted by Countries for the Year 2001

Country	GDP per capita(\$)	Production of electric energy (TWh)	Sources (%)				Use (TWh)	Export (TWh)	Import (TWh)
			Fossil fuels	Hydro	Nuclear	Other			
Albania	4400	5.3	3	97	0	0	5.9	0.2	1.2
Bos.Herz.	1900	10.0	54	46	0	0	8.1	2.6	1.4
Bulgaria	16500	41.4	48	8	44	0	32.5	6.8	0.8
Croatia	9800	12.1	34	66	0	0	14.2	0.4	3.4
Greece	19100	49.8	94	4	0	2	48.8	1.1	3.6
Macedonia	5100	6.5	84	16	0	0	6.1	0	0.1
Romania	7600	50.8	62	28	10	0	46.1	1.6	0.4
Slovenia	19200	13.7	35	27	37	1	13.8	3	4.1
Serb.Mont.	2200	31.7	63	37	0	0	32.4	0.5	3.3
Turkey	7300	116.6	80	20	0	0	112.6	0.4	4.5
		337.9					320.5	16.6	22.8

Source: *CIA-The World Factbook*, 2005 (adapted)

Unlike the ones presented above, data from other sources¹⁰⁾ show that the production of the electrical energy in the region of Southeast Europe has somewhat increased and it amounts to around 368 TWh (2002), while the other parameters mainly stay within the range presented above. It is to be expected that this will remain such for a longer period of time and that larger changes would be possible only with the realization of the bigger energetic projects in the region, as well as with

⁹⁾ *World Energy Council*, 2004

¹⁰⁾ *IEA Energy Statistics-Electricity*, 2005

the progress in the transition process of the regional economic structure, which is more or less intensively carried out in this geographic space within Europe. The dynamics of the transformation of the energetic structure within each one of these countries is most definitely specific, but it is relatively easy to present it by its basic characteristics.

The coal industry in **Bulgaria** has started to restructure during the mid 1990's. After an assessment of efficiency, it has come to a regrouping of all mining capacities in one of the following categories: economically vital mining sites, economically unstable mines, mostly underground mines and economically nonviable mining companies. Along with this, the government has gradually reduced the subventions to some of the underground mines, which resulted in their bankruptcy and shutdown. Afterwards, the government, in cooperation with the MMF, has developed a program for investing into developmental projects and improving the ecological performance of the coal industry for the next decade, which is being applied even today. As far as the electrical energetics is concerned, after the recommendations by the MMF, the separation of the electro-energetic activities has been done already in the year 2000, so the Bulgarian consumers have gotten an opportunity to choose their supplier of electrical power. As a future member of the EU (by 2007), Bulgaria has taken an obligation to gradually, by 2008, close the nuclear plant Kozloduy (built with Soviet technology), but in return has gotten an opportunity to increase the capacity of the other, more modern nuclear plant in Belene (up to 1000 MW). Besides the investments into the coal industry and into the thermoelectric power plants as well as the mentioned nuclear plant, there are plans in Bulgaria for more significant investments into the wind-run electricity factories (in the northeastern part of the country near Balchik). In that way, the Bulgarian production of electrical energy will become even more dispersed than it is today. That is, according to the IEA¹¹⁾, around 41% of Bulgarian electrical energy is produced from coal, 47% from nuclear fuels, 4% from natural gas, 6% from water power etc. Besides, this would create a possibility for this country to remain a significant exporter of electrical energy in the future.

In **Greece**, the process of reform (liberalization, restructuring and privatization) of the energy sector is being implemented for a long time, considering that the new market concept demands a full transformation of the Public Electrical Corporation (PPC), stabilization of the HTSO (the operator) and the corresponding activity of the Energy Regulatory Agency in accordance with the defined legislative norms and under the control of the Ministry for Development.

As far as energy sources are concerned, it is almost certain that lignite is going to stay the key strategic fuel for a long time and for the following reasons¹²⁾:

- Long-term security of supply considering that today's thermo-energetic capacities can use this resource potential for another 45 (West Macedonia), and 24 years (Megapolis).
- Relatively lower extraction costs, since the majority of the mines are surface mines and there is a possibility for applying continuous mining methods and capially intensive tools and gear.
- More stable production costs when compared to the other sources of energy, etc.

¹¹⁾ IEA *Energy Statistics-Electricity*, 2005

¹²⁾ For more information: "*Ensuring Investments in a Liberalised Electricity Sector*", Eurelectric, Brussels, 2004, p.65

This will most certainly result in long-term investments into coalmines, and then into thermoelectric power plants (Florina for example) and the improvement of their ecological performances. Besides that, the projects that would follow would be to activate the natural gas-based plant on Crete and a few other hydro-energetic capacities (Messochora), as well as for a more intensive investment into the recyclable resources. All this of course aims to satisfy the future demands of the electrical energy sector, but also to improve the variety of the energy source supplies in the future.

In **Croatia**, the future of the energy has not yet been defined. What is for sure is that they should soon start building some new electrical power plants, since the estimates show¹³⁾ that the country will lack around 4.3 TWh of electrical energy in 2010 considering the average growth of demand for electrical energy of 2.6% per year. Taking into consideration the already made decision of the Croatian Parliament, there is only one possibility left, and that is to build a gas-based thermoelectric power plant. Never the less, this demands for an additional import of this energy source with all the economic and other consequences it brings in the future.

Just like in the other transitional countries, in Romania, coalmining has for a long time been facing the common problems (bad quality of coal, low productivity, ecological problems, outdated fixed funds, etc.), which demanded high state subventions to the coalmines for a long time. In the sector of thermal energy, the traditional burning of coal dust together with many cogenerative facilities have dominated as well as the outdated facilities with a little possibility for using clean technologies for production of electrical energy. "Radical restructuring"¹⁴⁾ of coalmines has started with the help of the World Bank in two phases with a well-planned program and it is almost finished today. The immediate result of this was shutdown of 30 mines and of 8 smaller open mining sites, reduced employment to almost 1/3 compared to the previous state and minimization of subventions and growth of the production efficiency.

In the sector of electro-energetics, they have accepted a free market oriented economic policy¹⁵⁾, and after the realization of the "unbundling" activities, the production of electrical energy is done by three independent producers (thermoelectric plants, hydroelectric plants and nuclear plant "Chernavoda"). The transmission is done through the dispatcher center in the "Transelektrika" company. On the other hand, "Elektrika" is a company that with a large number of regional firms and distributive centers distributes electric power, while a special operator takes care of the market. The future tasks for the Romanian electrical economy is to finish investing in the second block of the nuclear plant "Chernavoda" (there is a plan to build the third block by 2011), which produces the cheapest electrical energy, to increase the capacity of the hydroelectric power plants from 5700 to 11000MW (revitalization of the existing and building new capacities), and to modernize and privatize the thermoelectric plants (of the installed power of around 10000MW). Through this process of transformation and investments are demonopolized and the market-oriented Romanian electrical economy will be easily incorporated into the energetic structure of the EU with a respectable surplus of electrical energy. It is estimated¹⁶⁾ that the overall investment into energetics in the period between 2003 and

¹³⁾ "Vjesnik", 05.03.2004.

¹⁴⁾ For more information consult "Rebuilding the Romanian mining industry" Mining Magazine", June 2003, P.266-267

¹⁵⁾ See further: "International Energy Outlook 2004, p.120, "Energy Markets", January 2001.

¹⁶⁾ *Insuring Investments in a Liberalised Electricity Sector*, Eurelectric, Brussels, 2004, p.140

2005 should amount to around 10 billion USD. The UCESCE of coal in the electro-energetic production would gradually fall from 60% (2001) to 44% (2010), that is to 24% (2025), and the UCESCE of natural gas would increase from 10% (2001) to 48% (2025). The production of electrical energy from oil would significantly drop, and the participation of the renewed sources would increase for 13-14%.

In the structure of the overall electrical energy production in **Serbia and Montenegro** in the last few years coal makes up about 66%. The restructuring of the coal capacities is just at its beginning. In the big surface mines "Kolubara" and "Kostolac", the non-mining activities have been separated as independent economic entities, which the main business (coal production) will financially support for the next 3-5 years until they become completely independent. The Government is pushing hard for this process, but it has been slowed down mostly because of the lack of finances. The restructuring of electro-energetics is also in its starting phase. At this time, they are emphasizing the revitalization of the electrical power plants, considering that according to the statements of the government employees¹⁷⁾ "the thermoelectric power plants are on average 22 years and the hydroelectric power plants around 27 years old". The domestic capital is definitely insufficient for these purposes, so foreign aid is necessary for solving the key energy problems because it, in some cases, completely changes the current electro-energetic situation. For example, the European Agency for Reconstruction has in the last few years invested around 130 million euros¹⁸⁾ into the thermoelectric power plant "Nikola Tesla" (installed power of around 3300 MW), which has most definitely influenced the efficiency of this facility.

Based on the previous reviews and detailed analysis in the Public Company for Electro-economy of Serbia and Montenegro, the assessment is that the needs for electrical energy on a long-term basis could be satisfied by building some thermoelectric power plants, considering that the locations for the construction of larger ecologically satisfactory hydroelectric power plants are gone. The estimates show that there should be enough coal for these facilities. The only problem could arise in the future if the enormous reserves of lignite in Kosovo become "definitely gone". The energy problems in this country could then be solved only with the influx of foreign capital. Evidently, "the estimates from April 2002 show that for the development of EPS until 2006, 2.4 billion USD need to be invested¹⁹⁾". These investments should only be used for the energetic priorities like the revitalization of the existing and the activation of the earlier started projects (Kolubara B for example).

In the production of electrical energy in **Turkey**, coal makes up around 25% (2002), and the Turkish government supports it in order to keep afloat domestic production and keep delivery security. In order to lower the costs of production (especially for stone coal), the programs for restructuring have been done and some coalmines have been shut down, but the Turkish coalmining will most probably need the subventions for yet some time. Besides, there will be a need for some more significant investments into the adjustment of coal-based thermoelectric power plants to abide by the European energetic standards. This would be one of the reasons why the Turkish Ministry for Energy has "transferred" 27 coal-based TE plants and the hydro energy to the state agency for privatization so they could be urgently privatized. Still, the most significant energetic (and irrigational) investment in Turkey (32 billion

¹⁷⁾ *Politika*, 05/21/2003

¹⁸⁾ *NIN*, 07.04.2005

¹⁹⁾ P.Kapor, *Međunarodno finansiranje infrastrukturnih projekata*, doktorska disertacija, Ekonomski fakultet, Beograd, 2002, p.237

USD), which needs to be finalized, is the investment into the hydro-electric and irrigational project of 7500 MW in southeast Anatolia, whose finalization would significantly lower the amount of the electrical energy imported.

Because of the lack of its own sources, the Turkish government has been pushing for a long time for a construction of electrical and transportation capacities through BOT projects (since mid 1980's) and BOO projects (since 1990's). BOT energetic projects are especially being pushed for after the great economic crisis 2000-2001 and the agreement with the MMF. The construction of three great energetic capacities of around 800 MW (Adapazar) and of around 1500 MW in Izmir and around 1600MW in Gebzen is being finalized through BOO project arrangements. With the end of investments and activation of the mentioned projects, a better use of available energetic potentials will be possible and the energetic dependency of Turkey on other countries will be significantly reduced.

3. Coalmining and Electro-energetics in Bosnia and Herzegovina at the Beginning of the 21st Century

3.1. The Coal Industry in Today's Bosnia and Herzegovina

The coalmining sector in BiH, just like in most of the countries in Southeast Europe, is traditionally a very important segment of the energetic and economic structure. Considering that there is no evidence of oil or gas reserves, coal makes up over 90% of the overall energetic potential of the country. Besides coal, hydro-energy is also a very important energetic potential in BiH. Its theoretical potentials are estimated²⁰⁾ to 8000 MW, technical potentials to 6800 MW and economic hydro-energetic potentials to 5600 MW. The potentials of smaller hydroelectric power plants are estimated to 2500 GWh /year. Besides coal and water energy in BiH, other energetic potentials are being estimated for energy production like for example theoretical potentials of solar energy of 74,65 Pwh and wind energy of 600 MW, as well as geo-thermal potentials of 33 MWth and significant potentials (1 million/m³ per year) for exploitation of biological mass for energy production. All mentioned energy resources, except for coal and water energy, are most probably the resources of the future. The water energy and especially coal are things of the past, present but also of the Bosnian energetic future.

The balance reserves of coal, mostly located in Tuzla, Middle Bosnian basin, Ugljevik and Gacko basins, are estimated to over 4 billion tons. They are mostly extracted (around 80%) from surface mines and are mostly burnt in local thermo-energetic facilities. The coal production in BiH has significantly dropped at the beginning of the 1990's due to war, but in the last few years, a slight growth has been noticed.

²⁰⁾[http:// www.eva.ac.at](http://www.eva.ac.at)

Table 3. Coal Production in BiH

In millions of tons

	1990	1996	2000	2004
Federation BiH	12.0	2.3	4.4	5.6
Republika Srpska	6.0	6.0	2.9	3.3
Total BiH	18.0	18.0	7.3	8.9

Source: Data of the Institute for Statistics of FBiH and RS for specific years

The coalmining sector in BiH today employs around 16000 workers and is organized into 15 different horizontally and vertically reintegrated and market-wise and infrastructurally unconnected companies, where some of them manage more than one mining site.

Today's situation in Bosnian industry of coal is largely economically and ecologically irrational, and is first and foremost characterized by:

- technological falling behind and continuous drop of productivity,
- noncompetitiveness when compared to the world coal standards
- continuous losses in business transactions
- chronic lack of capital for maintenance and investment
- unsatisfactory structure of employees etc.

The market price of coal for thermoelectric power plants in BiH today is around 2 (Federation BiH) and around 2.25 euros (Republika Srpska) and is somewhat lower when compared to the European coal prices. In some transitional countries, prices of coal in some specific cases include some restructuring expenses or closing of some unprofitable coalmining facilities (an example is the mine Hrastnik-Trbovlje in Slovenia). In BiH, on the other hand, that kind of developmental component is not even being considered.

It is necessary to emphasize that Bosnian coals (60% lignite) are most frequently with a high percentage of moisture and ash, so their burning in thermoelectric power plants is causing a number of problems. Looking at this on a long-term basis (considering that coal will most probably remain the primary energy-generating product in the country for a long time) demands for a trial of adjustment of technological schemes for coal finalization in the thermoelectric power plants to the available quality of coal. Taking into consideration this fact and the geographic position of BiH in the context of possibilities for supplying a better quality coal, USAID²¹⁾ experts are predicting that BiH "might never become a market of cheap electric energy", since according to them, this asks for a reduction of electro-energetic content in the total production costs at the state level. This kind of prognosis can naturally be taken with a grain of salt, considering that it demands a much more detailed elaboration.

3.2 Problems of Electric Companies in Bosnia and Herzegovina

The electro-energetics has also for a long time been one of the more significant factors of development of Bosnia and Herzegovina. The total of installed electro-

²¹⁾ USAID, *Elektroenergetski sektor, prestrukturiranje i privatizacija*, Sarajevo, 1997, p.7

energetic capacities is around 4000 MW (2002)²²⁾, out of which 50% goes to the production of thermal energy. The ratio of the hydro and thermo productions varies, depending on the hydro conditions during the year. During this same period, the total production in the country has been 11,3 Twh, and consumption amounted to 8,4 Twh, so a significant part of electrical energy has been exported into the neighboring countries.

At this time in BiH exist three vertically integrated energetic monopolies, which produce and distribute electrical energy in certain parts of the country:

- The Electrical Company of Bosnia and Herzegovina (EPBiH)
- The Electrical Company of Croat Community of Herzegovina (EPHZHB)
- The Electrical Company of Republika Srpska (EPRS)

The above-mentioned companies have their own proper production and a database of consumers, and their thermo-energetic power differs a lot.

Table 4. Consumption database and the electro-energetic power of Bosnian and Herzegovinian companies

Companies	Usage database (in 000)	Out of which domestic use (in 000)	Installed power of thermal energy (in MW)	Installed power of hydro energy (in MW)
EPBiH	619	557	1357	492
EPHZHB	168	152	-	803
EPRS	436	400	600	769
Total	1223	1109	1957	2064

Source: www.eva.ac.at, www.elektroprivreda.ba, 2003.

Each one of these companies has its own production, transportation and distribution, while a common electro-energetic and coordination board owned by all three companies coordinates the dispatching and provides the integrity of the system within the country. Taking into consideration the overall business expenses, the electro-energetic sector of BiH as a whole is continuously showing deficit. The only exception is EPHZHB in some years. The deficit is especially evident in EPBiH.

Table 5. Balance of success of EPBiH for years 2002 and 2003

In millions of Euros

No	Elements	2002	2003	Change in %
1	Total income	257.5	253.9	-1.4
2	Operative costs	207.9	188.7	-4.4
3	Working coefficient	0.81	0.78	-
4	EBIDA	49.6	55.2	11.4
5	Amortization	89.2	123.3	38.3
6	EBITDA	-39.6	-68.6	72.0
7	Operative coefficient	1.15	1.27	-
8	Incomes/expenditures from interest rates net	10.8	14.0	29.6
9	Other and extra incomes/expenditures net	9.2	-23.0	-350.0
	Loss for the year	-28.6	-72.6	145.3

Source: www.elektroprivreda.ba, 2004 (adapted)

²²⁾ <http://www.eva.ac.at>

The causes for these deficits are numerous. The energetic analysts most frequently start with the high price of domestic coal, which in the last few years makes up 50% of the operative costs of the thermal energy production.

Table 6. The operative costs structure in EPBiH by years

No	Elements	Years							
		1996	1997	1998	1999	2000	2001	2002	2003
1	Coal and transport	40.5	43.5	46.1	31.5	45.1	45.8	51.5	50.1
2	Brut salaries	23.1	20.2	23.2	22.2	26.4	26.0	22.5	23.2
3	Maintenance	12.7	7.7	9.2	2.5	1.8	2.3	5.5	5.8
4	Other operative costs	23.7	28.6	21.5	43.8	26.7	25.9	20.5	20.9
	Total operative costs	100.0	100.0	100	100	100	100	100	100

Source: www.elektroprivreda.ba for specific years

It is evident from the previous table that coal, as the largest operative cost of business transactions has a tendency to grow in the last few years, so the reduction of this cost in the function of growth of competitiveness in production of electric energy is extremely important.

Except for the high price of coal, other, mostly subjective factors also influence the irrational business activities of all Bosnian and Herzegovinian electrical companies, such as: unfavorably closed long-term contracts with the buyers of electrical energy, insufficient work optimization in certain facilities, inefficient investments, employee surplus etc. About the irrationalities in the coal business, one can best be informed from the reports done for all three of the BiH electrical companies²³⁾ by the independent revisers in the last few years. All this points out that demonopolization, as the first important step in the restructuring of the BiH electro-energetic sector, needs to be done as soon as possible.

3.3 Basic Goals and Problems of Realization of the Energetic Restructuring in Bosnia and Herzegovina

It is to be expected that, based on today's findings that coal production in Bosnia and Herzegovina will not increase significantly in the near future. Actually, this sector is expecting the inevitable restructuring (although belated when compared to the other countries of the Southeast Europe region due to war), which should besides other things result in significant investments and modernization of coalmining activities as well as decrease in employment. The ultimate goals of the restructuring of the BiH coal industries are most of all:

- realization of economically viable production,
- increase of competitiveness of domestic coal compared to the other imported energents,
- drop of production costs of coal bellow 2 Euros/GJ,
- decrease of number of workers from 15-16 thousand to 3-4 thousand people with a solution for the social status for the laid-off workers,

²³⁾All the reports are on the companies' web sites

- reaching a higher degree of security at work, etc.

In order to realize these vaguely defined goals within the coalmining facilities of the Federation of Bosnia and Herzegovina, the Federal Government has made an especially ambitious plan of activities for the first phase of restructuring (to be done by the end of 2007). According to this plan, there will be a need to invest over 190 million Euros of new equipment into the coalmines of FBiH and for revitalization of the existing in the first phase, so that the coalmining sites could be modernized, which would decrease the costs of production to around 1.4 Euros/GJ, and increase the production by around 30%, decrease employment by one third, etc.

The above mentioned goals are most of all a reflection of the actual situation as well as of a need for change in the economy of FBiH, where coalmining makes up over 10%, and energy around 40% of the total economic structure of FBiH. Still, if one has in mind that the mentioned investment planning assumes 5% of the Yearly Federal Budget and the insufficient willingness of the Government so far to get involved in the process of coalmine restructuring, then it turns out that this activity planning is more likely an expression of desires than realistic goals. Even more, if one takes into consideration the fact that it is necessary to secure over 35 million euros for solving the social status of the laid-off workers, and that for shutting down the non-profitable coalmining sites the resources are not even being planned. This implies that the restructuring of the coalmining sector in BiH is a politically and economically very important topic with certain social implications. These are most certainly the most important reasons why the restructuring of the coal industry in BiH is running really late in the true sense of that word and it seems that foreign sources (the World Bank, EBRD, etc.) are the only ones who can activate and accelerate this process.

As for the restructuring of the electro-energetic sector, it is certain that it has to be done in a way that would satisfy the current directives of the EU. The current functioning of the electro-energetic system, that besides the fact that it is not yet adequately networked (which of course results in more costs), is characterized by the following problems:

- business losses as a result of many causes in the business process itself,
- insufficient coordination in the business processes due to the division of the system,
- the unfinished reconstruction of the system due to lack of finances,
- high technical (and especially distributive) losses, because of the use of outdated fixed funds and bad process management,
- inefficient management structure and system organization, as well as the lack of responsibility for the business results,
- electric companies burdened by assisting business branches,
- significantly larger number of employees from the international standard (1 worker for each MW of production capacity), etc.

Unlike the coal industry, the process of restructuring of the electro-energetic sector in BiH has already started by passing a law about foundation and work of the State Regulatory Commission for Electric Energy, an independent system operator and a company for the transport of electric energy. This process, never the less, is progressing very slowly.

Just like in other countries, the main goals of the electro-energetic restructuring in BiH are decrease of prices of electric energy and a continuous

supply and economic use of resources, which imply a possibility for BiH to get an “efficient and competitive electro-energetic market which encourages trade and secures a continuous supply of electric energy to all parts of BiH by predefined quality standards and the lowest prices possible”²⁴. In any case, all this demands a formed domestic market of electric energy, which would function abiding by the European market rules, and at the same time asks for corporations to be formed, for commercialization and finally, a privatization of the energetic companies.

The upcoming repartition of the energetic market in Europe adds some complexity to this task, which for a country like BiH that is lagging behind in the processes of transition, could be an added impulse to accelerate the transformation of energy. This will, on the other hand, need a lot of time, but also some investments into the energetic structure of BiH, whose sources even in this case need to be looked for abroad.

Conclusions

The main goal of this paper was to, as concisely as possible, point out all the complexity of the problems of restructuring of the energetic sector in Southeast Europe and especially to the urgency for the acceleration of this process in BiH. As it could be seen in the last decade, the Southeast Europe has, just like some other European regions, found itself in the process of great changes in the fields of organization and working of the energetic sector. These changes are characterized mostly by restructuring and privatization of the coalmines and electrical companies, as well as deregulation and inclusion of all energetic subjects into the newly formed markets for electrical energy.

The beat and pace for these changes in Southeast Europe are set by current (Slovenia and Greece) and soon-to-be members of the EU (Bulgaria and Romania). These countries have achieved the best results in the optimization of development of coal and of electrical energy, in opening the electrical energy market and regionalization of the energetic infrastructure. The other countries are more or less behind in this process for different reasons.

The changes presented in this paper have touched BiH the least, since it has started this process much later due to the war that has been going on between 1992 and 1995. It is clear from the presented pointers that this country will need a lot more time to get included into the European energetic flows, considering that the process of energetic restructuring has just started here. This is the reason why the energetic changes in BiH are becoming an imperative and have to be done most urgently if there is a desire to fulfill the requirements for a full-fledged membership in the European Union as soon as possible.

²⁴ FBiH Government, *Izjava o elektroenergetskoj politici*, Sarajevo, April 2002god.

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