Electricity Reform in Serbia

by
Sandra Jednak
Faculty of Organizational Sciences, University of Belgrade
&
Dragana Kragulj
Faculty of Organizational Sciences, University of Belgrade
&
Milica Bulajic
Faculty of Organizational Sciences, University of Belgrade
&
Russell Pittman
Antitrust Division, US DOJ, and New Economic School, Moscow

CCP Working Paper 08-12

Abstract: According to the Agreement on Stabilisation and Integration to European Union, Serbia is obliged to implement reforms in the power sector and its power policy must be in accordance with the European Union power policy. Power sector reforms in Serbia have been started, and certain results were achieved. But, the electric power infrastructure became technologically obsolete, and for its reconstruction significant investments and the active participation of the state are necessary. Operative efficiency is at very low level. Also, Serbia has not yet decided whether the Serbian Electric Power Industry will be privatised, and if it is privatised which model will be applied and when.

September 2007

***JEL Classification Codes*:** L94, Q40, Q48
***Keywords*:** electricity, restructuring, competition, investments, prices

Acknowledgements:
The views expressed are not those of the U.S. Department of Justice. The support of the Economic and Social Research Council is also gratefully acknowledged.

Contact details:
Sandra Jednak, Faculty of Organizational Sciences, University of Belgrade,
154 Jove Ilića Str., 11 000 Belgrade, Serbia
sjednak@fon.bg.ac.yu

ISSN 1745-9648

1. Introduction

Serbia is a country with 88,361km^2 of area and a population of 7,498,001 (without Kosovo). Serbia is situated at the intersection of Pan European Corridors Nr.10 and Nr. 7 linking Europe and Asia. The river Danube runs thought Serbia (588km). Furthermore, Serbia benefits from a significant deposit of natural resources especially minerals and agriculture land that is fertile and arable. GDP per capita in 2006 was 3,280€. Serbia started the real transition process in 2000. From then it has run successful reforms. Among those reforms are reforms in the energy sector. The energy sector is one of the state's main resources. Energy, next to telecommunication and agriculture, is the biggest sector for development. In this sector the most important and the greatest participants are the Serbian Electric Power Industry and the Serbian Oil Industry.

In the European Union, the process of reorganising and restructuring the electric power market has been started by the implementation of the Directive on electric power. [1] Considering that Serbia aims at European Union integration, it is obligatory to harmonise the rules and regulations of the power sector with the European Union requirements. This process has been started by signing a Memorandum on creating a regional electric power market in South East Europe, its integration into the internal electric power market in the European Union in 2002 and 2003 – the so-called Athens Memorandum. In October 2005, countries of this region also signed The Energy Community Treaty establishing the Energy Community of South Eastern Europe (ECSEE). Serbia, as well as most of the candidate countries, has implemented EU regulatory rules in its own law, as part of the changes that are prerequisite for accession. It has also adopted a common approach of electric power reforms i.e. legal, structural and institutional changes.

By signing the Electric Power Community Contract and according to the Athens Agreement about single electric power market foundation in South East Europe, Serbia promised to abolish the monopoly of the state owned electric power industry and to set conditions for an electric power market from 2008. In spite of the adopted laws, there is no developed internal electric power market in South East Europe. Serbia, as the central Balkan country, is interesting for electric power trade, because it is practically unavoidable in the regional market. Serbia is faced with two obligations: the need for a market-oriented and competitive power sector and the need to completely realise that nature and natural resources are limited and expensive. In order to achieve these aims, it is necessary to reorganise existing production capacities and to invest in the new production plants, and to understand that energy, natural resources and the human environment are to be saved by efficient energy use. These reforms were started by adopting Energy Law in 2004 and they have been in power since then. Beside the Energy Law, Serbian energy policy is incorporated in the Energy Development Strategy up to 2015. Energy policy is based on three elements: efficient energy use, increased use of renewable

[1] Directive 96/92/EC about the internal electrical power market in the European Union.

energy sources, and development of competitiveness, that is, market-oriented electric power industry. Serbia has established new institutions: the Energy Agency and the Energy Efficiency Agency. The Serbian Electric Power Industry was restructured but there is still need for further changes: method of privatisation, investments, and applying a new tariff system.

2. Background on Electricity Sector

Electric Power Industry development in Serbia began in 1881, when the first open-air restaurant in Belgrade was lit by direct current lamp. The first power plant in Serbia was started up in 1884. However, the beginning of electrification in Serbia is considered to be 6 October 1893 (the first public electric thermal power plant was put into operation in Belgrade). The first long-distance transmission line in Serbia, 17 kilometres long, was put into operation in 1903. "Snaga i svetlost", one of the biggest thermal power plants in the Balkans, was built in Belgrade in 1933. *Serbian Electric Power Enterprise* was founded in 1945, after World War II. "Bajina Basta" Hydroelectric Power Plant was put into operation in 1966. The two largest electric generating plants in Serbia, "Djerdap" Hydroelectric Power Plant and "Nikola Tesla" [2] Thermal Power Plant, were put into operation in 1970.

By the 1990s, the Serbian Electric Power Industry was in the expansion phase and witnessing the establishment of an efficient and modern system. The break up of the former Socialist Federal Republic of Yugoslavia and the imposition of sanctions had an impact on further development of the Serbian Electric Power Industry. Because of a lack of financial resources, the building of new capacities was stopped and it aroused the maintenance problem of existing electric generating and transmission capacities.

The new Law on the Electric Power Industry was passed during 1991, by which time the electric power enterprises became publicly and state owned. It was then that public enterprise was founded – *Serbian Electric Power Industry (EPS)*. This enterprise comprises all three activities: electric power generation, transmission and distribution of electricity as well as coal production, including surface mining and underground mining. Thermal power plants relying on coal (lignite), then hydroelectric power plants (reversible and reservoir hydroelectric power plants) are dominant in the sector while thermal power plants which rely on gas and liquid fuel make up the rest of the sector. Surface mining is done in three coal mines: in Kosovo-Metohija[3], Kolubara and Kostolac.

The restructuring process of all public enterprises was started in Serbia in 2003. The greatest difficulties of these enterprises are operating losses, a lot of employees and the problem of subsidiary activities. Public enterprise restructuring proceeds in phases which are formulated in Business strategy plans of certain public enterprises. The privatisation project of the public sector aims at developing strategies of gradual withdrawal of the country from the public sector. First, it is anticipated that the state will withdraw from the

[2] http://www.obrenovac.org/privreda/tent/index.htm
[3] The EPS have not been able to manage their facilities at Kosmet since 1999.

commercial sector, and then gradually from the public sector (sector for general purpose). In the same way, the state will continue to strive to make an institutional framework and regulative body for market-based business operation of these entities. Thereby, it will provide control of the use of adopted solutions. In this way, the Serbian Electric Power Industry – EPS – has been also restructured.

3. The Regulatory Environment for the Electricity Reform Programme

By passing the Energy Law (2004), the possibility for many activities concerning Serbian integration into the regional electric power market in South East Europe was made, that is, integration into the South East European Electric Power Community. This law predicts the end of the Serbian Electric Power Industry's monopoly, improvement in competitiveness in power generation, and functioning of the market in which all producers, under the same conditions, will be enabled to have access to transmission and distribution of electric power. The basic goals of this law are: safety and protection of low load factor consumers, integration into regional and European markets, and drawing investments.

According to this law, the company that will take care of power transmission should be independent and it should enable all producers and traders to have free access to the power transmission system. The content of this law is the planning of electric power development, foundation of the Energy Agency and the Energy Efficiency Agency, the field of electric power, oil and oil products, natural gas, thermal energy, and completion dates. The main areas of activities within the electric power development plan are: energy policy, strategy of power development, implementation of the strategy plan, and energy balance. Energy policy comprises the following measures and activities concerned with: electric power supply safety, long-term and balanced development, market working conditions, safety and reliability of electric power system operations, coordination of activity development and new technologies, energy efficiency, attractive investment conditions, incentives of renewable energy resources, environmental protection and decentralisation of rights and liabilities. The writing of the energy balance,[4] in other words the annual claims and claims settlement per month, is of exceptional importance. The expected consumption and required investments in every activity are defined in this balance.

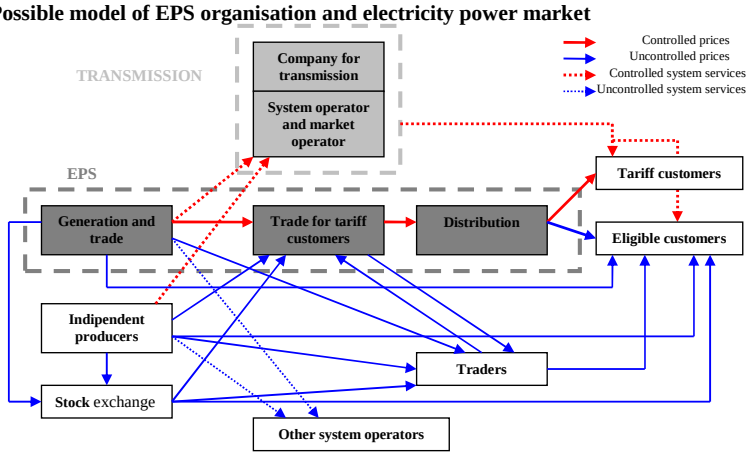
The Energy Law contains a special part which refers to electric power. Power generation is comprised of generation of electricity in hydroelectric power plants, thermal power plants, combined heat and power plants and power plants relying on renewable energy sources or waste. In addition to these producers, the privileged producers are also defined. The privileged generating

[4] The energy balance is an electric power generation and consumption plan for a month and for a year. It is based on possibilities of production and planned consumption needs, agreed electric power deliveries and agreed electric power import, in order to cover balance surpluses, that is, electric power import for investment of energy balance surpluses.

plants in the generation process use renewable energy sources or waste, and then electric power plants of small capacity (electric power plants of power amounting to 10MW) and generating plants that simultaneously generate electric and thermal power. All these producers are obliged to transmit generated electric power to the electric power subject that is responsible for the supply of tariff customers. This amount of energy is determined by a consolidated annual energy balance of all tariff customers. The Serbian Electric Power Industry is the main producer of electricity. Apart from this role, the Serbian Electric Power Industry distributes electric power and manages the distribution system.

The electric power distribution system consists of high voltage system amounting to 400kV, 220kV, and 110kV (part of the system) as well as the other power plants, telecommunication system, information system and other infrastructure facilities necessary for power system operation. Transmission system management is carried out by the transmission system operator. In Serbia, it is done by the Serbian Power Transmission Company – EMS. In addition to a transmission system operator, a market operator is also defined by law. It defines market economy, keeps records of all contracts, and it is also responsible for market organisation. This is also done by EMS. Figure 1 shows a possible model of electricity power industry organisation and the electricity power market.

Figure 1: **Possible model of EPS organisation and electricity power market**



According to this law, electric power distribution enterprises in Serbia will operate as independent companies under significantly modified conditions. Electric power distribution will operate under a monopoly, but electric power sale will be subject to the market. In this way, the power generation function and distribution function will be separated from electric power transmission. In accordance with this, restructuring of public enterprises was carried out.

4. Recent Performance of the Electricity Reform Programme

According to the Energy Law[5] from 2004, the Serbian Government issued a decree on founding the public enterprises: the Serbian Electric Power Industry (EPS) and the Serbian Power Transmission Company (EMS). The decrees on founding the two abovementioned public enterprises became valid on 7 July 2005. The Serbian Electric Power Industry is authorised for generation and distribution of electricity, distribution system management, electric power sale and coal production and processing, while the main activities of Serbian Power Transmission Company are electric power transmission, transmission system management and electric power market management. Both of them are 100% owned by the Republic of Serbia. The process of financial and economic consolidation and rationalisation of resources was continued in 2005. Subsidiary activities were set aside and separate enterprises were formed within public enterprises. In addition, law regulations were modified.

4.1 The Serbian Electric Power Industry

By 2005, the Serbian Electric Power Industry was a totally vertically and horizontally integrated company which consisted of and managed 23 public enterprises. After a restructuring process, public enterprise, the Serbian Electric Power Industry, is a vertically organised enterprise which consists of 11 public electric power enterprises, out of which six deal with electric power and coal production and five deal with electric power distribution. The enterprises for power generation and coal production are:

1. *Nikola Tesla* (Obrenovac) – Thermal Power Plant;
2. *Kostolac* (Kostolac) – Thermal Power Plant and Coal Mining Basin;
3. *Pannonian electric power plants* (Novi Sad) - Combined Heat and Power plants;
4. *Djerdap* (Kladovo) – Hydro Power Plant;
5. *Drinsko-Limske* Hydro Power Plants;[6]
6. *Kolubara* (Lazarevac) - Coal Mining Basin; and
7. *Kosovo* (Obilic).[7]

Electricity is distributed by the following enterprises:

1. *Elektrovojvodina* (Novi Sad);
2. *Electrodistribution Belgrade*;
3. *Elektrosrbija* (Kraljevo) joined with *Electrodistribution Uzice*;
4. *Jugoistok* which consists of: *Electrodistribution Nis*, *Electrodistribution Leskovac, Electrodistribution Vranje* and *Elektrotimok* (Zajecar); and
5. *Centar* which consists of *Elektromorava* (Pozarevac) and *Elektrosumadija* (Kragujevac).

The total power capacity of the Serbian Electric Power Industry is 8,355MW. Thermal power capacities provide it with 65%, while hydroelectric power

[5] Službeni glasnik RS broj 84/04.
[6] This is one enterprise within the Serbian Electric Power Industry. It consists of hydroelectric plants on the river *Drina* (Bajina Basta) and on the river *Lim* (Nova Varos).
[7] The Serbian Electric Power Industry has not been authorised for the distribution enterprises of Elektrokosmet (Pristina), thermal power plant Kosova or coal mining basin since 1 July 1999.

makes up almost 34% of total electric power capacity. The thermal power capacity of the Serbian Electric Power Industry consists of eight thermal power plants of total installed power amounting to 5,171MW which rely on lignite, as well as three combined heat and power plants of total installed power amounting to 353MW which rely on liquid and gas fuels. In the Serbian electric power system, there are nine hydroelectric power plants, with fifty hydro generating sets, the total power of which amounts to 2,831MW. Besides this, the Serbian Electric Power Industry operates with three power plants (HPP Piva, HPP Gazivode and Heating Plant Belgrade) that are not in its ownership. These have total capacity of 461MW. Total power capacities of the Serbian Electric Power Industry and the ageing equipment of power plants are shown in Table 1.

Table 1: Basic Characteristics of Plants and Year of Beginning Operation

POWER PLANTS	***TOTAL POWER MW***	***YEAR OF BEGINNING OPERATION***
THERMAL POWER PLANTS (25 blocks of total power)	**5.171**	
TPP Nikola Tesla A	1.502	1970-1979
TPP Nikola Tesla B	1.160	1983-1985
TPP Kolubara	245	1956-1979
TPP Morava	108	1969
TPP Kostolac A	281	1967-1980
TPP Kostolac B	640	1987-1991
TPP Kosovo A	617	1962-1975
TPP Kosovo B	618	1983-1984
COMBINED HEAT AND POWER PLANTS (6 blocks of total power)	**353**	
CHP Novi Sad	208	1981-1984
CHP Zrenjanin	100	1989
CHP Sremska Mitrovica	45	1963-1979
HYDROELECTRIC POWER PLANTS (Run-of-river power plants – 31 sets of total power Reservoir power plant – 17 sets of total power Reversible hydroelectric power plant – 2 sets)	**2.831**	
HPP Djerdap I	1.058	1970-1972
HPP Djerdap II	270	1985-87,1998,2001
HPP Vlasina	129	1955-1975
HPP Pirot	80	1990
HPP Bajina Basta	364	1966-1968
RHPP Bajina Basta	614	1982
HPP Zvornik	92	1955-1958
HPP Elektromorava	13	1954-1957
HPP Limske	211	1967-1979

Note: Year of beginning operation shows period when first and last set/block began operation.

Source: EPS

Data from Table 1 show that the Republic of Serbia has old electric power plants. Hydroelectric plants, in other words their generating sets, are as old as the generating blocks of thermal power plants. The last plant for electricity power generation was built 15 years ago. Because of a lack of financial assets TPP Kolubara B has been building for 20 years: there is need for about 550 million euros to finish it. If the Government does not take the decision for

building new thermal power plants, Serbia will have a shortage of electric power.

In 2005, the thermal power plants of the Serbian Electric Power Industry generated 26,565GWh, while hydroelectric power plants generated about 11,924GWh of electricity. In 2006, total power generation of all plants was 38,452GWh, from which thermal power plants generated 27,602GWh, and hydroelectric power plants, 10,850GWh. Power generation in each electric power plant for 2005 and 2006 is shown in the Table 2. The breakdown of electric power generation for 2005 was: thermal power plants relying on coal contributed 68 % of power generation; then run-of-river power plants provided 26.3%; and storage power plants, 3.1%. Reversible hydroelectric power plants contributed 1.6 % and combined heat and power plants participate with 1 %.[8]

Table 2: Structure in Electric Power Generation (2005 and 2006)

	2005	**2006**		**2005**	**2006**
ELECTRIC POWER PLANT	**GWh**	**GWh**	**ELECTRIC POWER PLANT**	**GWh**	**GWh**
TPP Nikola Tesla A	8545	8840	HPP Djerdap I	6043	5301
TPP Nikola Tesla B	7270	8295	HPP Djerdap II	1412	1211
TPP Kolubara	1175	1231	HPP Vlasina	399	409
TPP Morava	723	626	HPP Pirot	178	143
TPP Kostolac A	955	856	HPP Bajina Basta	1822	1720
TPP Kostolac B	3471	3513	RHPP Bajina Basta	621	615
TPP Kosovo A	746	1022	HPP Zvornik	562	517
TPP Kosovo B	3300	3040	HPP Elektromorava	78	64
THERMAL POWER PLANTS	**26184**	**27422**	HPP Limske	809	869
CHP Novi Sad	251	136	**HYDROELECTRIC POWER PLANTS**	**11924**	**10850**
CHP Zrenjanin	111	35			
CHP Sremska Mitrovica	20	9			
COMBINED HEAT AND POWER PLANTS	**381**	**180**			
ELECTRIC POWER PLANTS OF ELECTRIC POWER INDUSTRY OF SERBIA (2005 and 2006)				**38489**	**38452**

Source: EPS

Looking back at the period from 1970 to 2000, and also the last four years, it is noticeable that power generation increases in thermal power plants relying on coal and in hydroelectric plants, while the combined heat and power plant, having initially recorded a production increase in 1990 and in 2003, afterwards it recorded a drop in power generation. The exception was 2006, when hydropower plants, beside the CHP, also had a generation decrease. This is shown by Table 3. According to this fact, Serbia needs to invest in thermal power plants and mining. Coal is a cheap energy product and it is not necessary to import it. Also, it is the most important energy resource of Serbia. Power generation relying on coal requires a great number of employees, as well as the maintenance and spare parts production provided by the electrical and machine building industry. Total coal production in 2005, excluding that of Kosovo, was 34,569,848t. Unlike coal, gas used for power generation is

[8] EPS.

imported (total amount) mostly from Russia. Thermal power plants relying on coal contribute the most to power generation in Serbia. However, one of the disadvantages of using coal for power generation is environment pollution. Because of the regulations on environment protection, a lot of thermal power plants modernise existing plants and construct new, efficient plants, which for the same amount of generated power emit less carbon dioxide into the atmosphere. Another issue is the status of Kosovo. More than 80% of exploitation supplies are available in the Kosovo coal mine with an estimated value amounting to 100 billion euros. If it were not possible to use those supplies, it would be necessary to release some extra budgetary supplies in the Kolubara and Kostolac coal mines. It means that Vreoci, the Belgrade-Bar railway, the Ibar primary route and the other structures in the central Kolubara coal mine would be displaced, and in that way it would be excavated for more than 500 million tons of coal. It would be possible to provide coal for thermal power plants with all these supplies until 2060 (including a planned capacity increase for 700-800MW in 2011). [9]

Table 3: Electric Power Generation in Plants in Serbia (1970–2006), GWh

Year	***TPP (coal)***	***CHP***	***HPP***	***Total***
1970	4140	51	3201	**7392**
1980	13559	86	10850	**24495**
1990	27074	1182	8337	**36593**
2000	20995	233	10337	**31565**
2003	23712	606	9118	**33436**
2004	23715	353	11021	**35089**
2005	26184	381	11924	**38489**
2006	27422	180	10850	**38452**

Source: EPS

Power distribution is also an activity of EPS. This activity is performed by five economic associations. Of these five associations, three (*Elektrovojvodina*, *Electrodistribution Belgrade and Elektrosrbija* (Kraljevo)) have the highest share of electricity power sales. The length of network is 155,541km. Due to lack of investments and low energy tariffs in recent periods the power distribution network has had significant power losses. However, since 2000 EPS has started to invest in this network by favour of foreign donations. The objectives of distribution are an increase in new consumers, reduction of technical losses, improvement of voltage conditions and supply reliability. From 2005 to 2006, the number of buyers increased from 3,552,665 to 3,590,108. Annual distribution energy also rose from 26,773 to 27,023GWh. Table 4 shows deliveries to buyers in Serbia.

[9] *Do 2060.godine – bez bojazni,* NIN, Specijalni dodatak, 2005, str.27.

Table 4: Deliveries to Buyers in Serbia

VOLTAGE LEVEL	ELECTRIC POWER 2005 GWh	2005 %	2006 GWh	2006 %	NUMER OF BUYERS 2005	2006
110kV	1179	4.40	1182	4.37	12	12
35kV	525	1.96	484	1.79	7	76
10(20)kV	4339	16.2	4519	16.72	3906	3982
Low voltage (0.4kV I level)	2702	10.09	2952	10.92	36298	41863
Residential consumption (0.4kV II level)	2011	7.51	2010	7.44	309105	313132
Households	15579	58.19	15448	57.17	3187538	3214931
Public lighting	437	1.63	428	1.58	15729	16112
Total	**26773**	**100.00**	**27023**	**100.00**	**3552665**	**3590108**

Source: EPS

Supply and consumption of electric power of 2004 and 2005 is given in Table 5. The available electric power supply for consumption can be calculated in the following way: net amount of power generation plus net amount of electric power import minus transmission and distribution losses and minus expenditures for pumping storage of water. Within net consumption, the difference is made between power sector consumption and final consumption in the industry sector, the household sector, etc.

Table 5: Energy Balance of Electric Power Generation and Consumption in Serbia

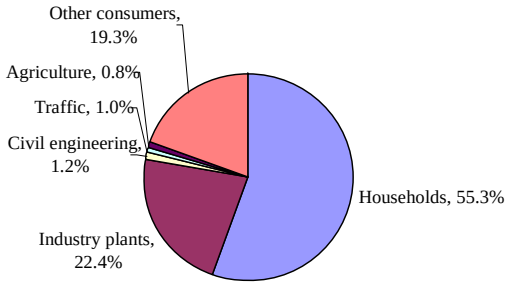
Supply and consumption	Electric power, GWh 2004	2005
Primary power generation	-	-
Power generation by transformation	**33874**	**36474**
Hidroelectric stations (included and reversible HPP)	11121	12032
Termal power stations	22166	23873
Combined Heat and Power plants (CHP)	452	381
Industry plants	135	188
Heating plants	-	-
Rafineries	-	-
Coal Mines	-	-
Coal processing	-	-
Import	5975	6751
Export	6248	8694
Balance of supplies	-	-
Internattional	-	-
Statistical difference	-	-
Total available energy	**33601**	**34531**
Power generation cost	-	-
Termal power stations	-	-
Combined Heat and Power plants (CHP)	-	-
Industry plants	-	-
Heating plants	-	-
Rafineries	-	-
Coal Mines	-	-
Coal processing	-	-
Power consumption in power sector	**3301**	**3519**
Hidroelectric stations (included and reversible HPP)	57	51
Pumping	801	962
Termal power stations	1511	1735
Combined Heat and Power plants (CHP)	55	46
Industry plants	6	33
Heating plants	180	186
Rafineries	143	122
Coal Mines	548	384
Coal processing	-	-
Transmission and distribution losses	**5633**	**5349**
Available energy for final consumption	**24667**	**25663**
Final power consumption	**24667**	**25663**
Industry plants	5687	5757
Civil Engineering	318	297
Traffic	239	246
Housholds	13626	14191
Agriculture	207	216
Other consumers	4590	4956

Source: Electric power and thermal energy balance, 2004 i 2005, (2006), Working document, the Republic Serbia - Republic Bureau of Statistics, ISSN 1820-0141, September 2006, No. 53

By analysing those two years it becomes noticeable that there is an increase of both generation and consumption. In 2004, power plants generated 33,874GWh of electricity power, while final consumption was 24,664GWh. The EPS exported 273GWh more than it imported. In 2005, even though there was a generation rise, EPS had to import energy power to cover increasing consumption to amount of 6,751GWh, but also because EPS exported 8,694GWh.

The largest group of final power consumers is the household sector with 55.3%; then the industry sector with 22.4%; then other consumers with 19.3%; and finally agriculture, civil engineering and traffic with 3% (data for 2005).[10] Electric power consumption per capita in Serbia was 3,747KWh in 2004, and in 2005 it was 3,922KWh. In 2005, the total number of consumers using high and medium voltage was 3,294,593, while those using low voltage numbered 3,291,020. Figure 2 shows final power consumption.

Figure 2: Final Power Consumption (2005)



Planned total net electricity power generation for 2006 was 31,305GWh; that is, 7% less electricity power generation than in 2005. Planned net amount of electric power import in 2006 was 1,289GWh. The net amount of electric power imported in 2005 was -1,943GWh (in other words the electric power exported was 1,943GWh higher than that imported).

Planned consumption in the power sector (for 2006) was approximately the same as power consumption in 2005. Final power consumption keeps growing and it was planned to be 26,263.3GWh in 2006. This power consumption is 2.3% higher than it was in 2005 (25,663GWh). Contrary to final electric power consumption, which keeps growing, final thermal power consumption was reduced by 34% when compared to 2005.[11] Final power consumption in the industry sector from 2001 to 2005 is shown in Table 6.

[10] *Energetski bilans električne i toplotne energije*, 2004 i 2005, (2006), Radni dokument, Republika Srbija-Republički zavod za statistiku, ISSN 1820-0141, septembar 2006, broj 53: http://webrzs.statserb.sr.gov.yu/axd/rdokumenti/rd53g06.pdf

[11] http://pks.komora.net/PrivredauSrbiji/Privrednegrane/Energetika/Energetskibilans/tabid/310/Default.aspx

Table 6: Final Power Consumption in the Industry Sector (2001–2005)

Year	2001	2002	2003	2004	2005
Final power consumption in GWh	8452	8594	7631	9052	9453

Source: Statistical Yearbook of Serbia 2006, p.253

Present electric power production levels and capacity reliability cannot be maintained without larger investments in revitalisation, capacity modernisation and investments in the mines and plants. In order to provide the necessary level of power generation for incremental electric power consumption, it is necessary to continually invest**,** together with production increase.

The Serbian Electric Power Industry should invest 3.2 billion euros in its system improvement in the following four years, and most of EPS's financial resources will be provided from its equity capital. However, due to its poor financial situation, the Serbian Electric Power Industry cannot invest in the construction of new electric power plants and coal mines, distribution networks or change of watt-hour meters. According to the plan that the Government must approve, EPS should invest half of its financial resources, while somewhat less than a billion euros is expected from a strategic partner.[12] The biggest investment projects are for completing construction of the Thermal Power Plant "Kolubara B"; for the contract of the third unit of the Thermal Power Plant "Nikola Tesla B" in Obrenovac; and reconstruction of combined heat and power plant "Panonija". The contract was planned in cooperation with strategic partners. Beside those projects, EPS is planning to invest 1.2 billion euros in environmental protection.

The Serbian Electric Power Industry placed an advertisement looking for a strategic partner in the *Financial Times,* because EPS cannot finance the project by itself. These projects are a continuation of construction of Kolubara B Thermal Power Plant for power amounting to 700MW, or construction of a 700MW electric power plant relying on lignite by means of greenfield investments. Investment in an adequate mining industry is also necessary. About 350 million euros were invested in Kolubara Thermal Power Plant. It is also necessary to invest about 800 million euros, and of that amount 550 million euros should be invested in electric power plant and more than 200 million euros in the coal mine, which will provide coal for electric power plants. The other project is the conversion of the thermal power plant and heating plant in Novi Sad (135 + 110MW) to a modern CCGT CHP plant of high efficiency (a combined co-generative gas turbine plant for thermal and electric power generation). The gas turbine would be built in the existing plant or a new modern block would be built. Potential partners for this second project would be Novi Sad with thermal consumption amounting to more than 300MWt, and Novi Sad Refinery with potential production steam consumption amounting to over 300/h. The possibilities of strategic partner involvement are as follows: joint investment i.e. a joint venture company with the Serbian Electric Power Industry, in which each of them would valorise its part depending on the investment; then possibility of direct investment of capital; and finally

[12] http://www.blic.co.yu/blic/arhiva/2006-10-26/strane/ekonomija.htm

decapitalisation or some other form of investment.[13] It is decided that selection of a strategic partner for both projects, which will be realised independently, should be carried out by tender.

The abovementioned investment projects would also be possible if the price of electricity power was more than 7c€/kWh till 2012. Until there is no increase in price, the EPS will invest first in maintenance, then in development. The annual income of the investments needed for maintenance of the present production level should amount to 300 million euros. For investment realisation in 2006, it was planned to invest 331.9 million euros, broken down into the following:

a. equity capital – 161.0 million euros;
b. electric power consumer's assets and Serbian Government loans – 37.4 million euros;
c. donations – 34.7 million euros; and
d. foreign credits – 98.8 million euros.[14]

The majority of these amounts is planned for coal production processing and transport. Investment increase in open-pit coal mines aims to provide an additional quantity of coal for improving production levels in reconstructed thermal power plants. Moreover, there are investments in revitalisation of the plants TPP "Kostolac", HPP "Djerdap I", HPP "Bajina Basta" and TENT 4, and for modernisation and development of the distribution network.

Future activities that will be carried out in the process of rationalisation of enterprise, work organisation, business operation and continuation of restructuring will proceed according to the Serbian Electric Power Industry's list of priorities:

- rational organisation (providing production with low total costs, reduction of excess costs, and so on);
- efficient organisation (realisation of production plans, high level of reliability and availability, efficiency improvement of existing capacities, and so on);
- modern organisation that will be adaptable to future changes (market, development of production capacities, ecological demands, information technology, and development of engineering services, and so on);
- human resources development; and
- clearly measurable results of all realised goals in the sense of size, quality and deadlines. [15]

4.2. The Serbian Power Transmission Company (EMS)

The Serbian Power Transmission Company (EMS) is the public enterprise for electric power transmission and management of the transmission system and electricity market. It comprises three branches: for transmission (transmission of electricity), for management (system operation) and for market (organisation of electricity market). The main objectives of this company are: provision of a

[13] Obradović D., 2006, *Razvoj uz strani kapital,* Časopis kWh, broj 388, str. 17.
[14] Annual report of EPS.
[15] EPS ICAS – BBP, Project ID No: 002/001/2006.

high level of security for the transmission system; sustainable development and integration of transmission capacities into a single system; transparent and non-discriminatory cross-border access; increased efficiency in maintenance of transmission capacities; economic-financial consolidation accompanied by efficient and cost-effective operation; maintaining an influential position in the region; and joining the process of establishment of the regional market in South East Europe.

This public utility has regional transmission units: *Belgrade, Bor*, *Valjevo*, *Krusevac*, *Novi Sad* and *Oblic*. The Serbian Power Transmission Company has 96 high-frequency substations where there are 184 transformers of total installed power amounting to 17,331MVA. One part of this system is in Kosovo, and the Serbian Power Transmission Company is not authorised to use it. The transmission system operates at different voltages (10kV, 35kV, 110kV, 220kV, 400kV) throughout the Serbian territory. The length of the transmission system amounts to 9,864.08km. A part of that, which is 1,035km long, is in Kosovo under UN interim authority.[16] Basic characteristics are shown in Table 7. This enterprise employs 1,370 workers.

Table 7: Basic Characteristics of EMS' Transmission Network

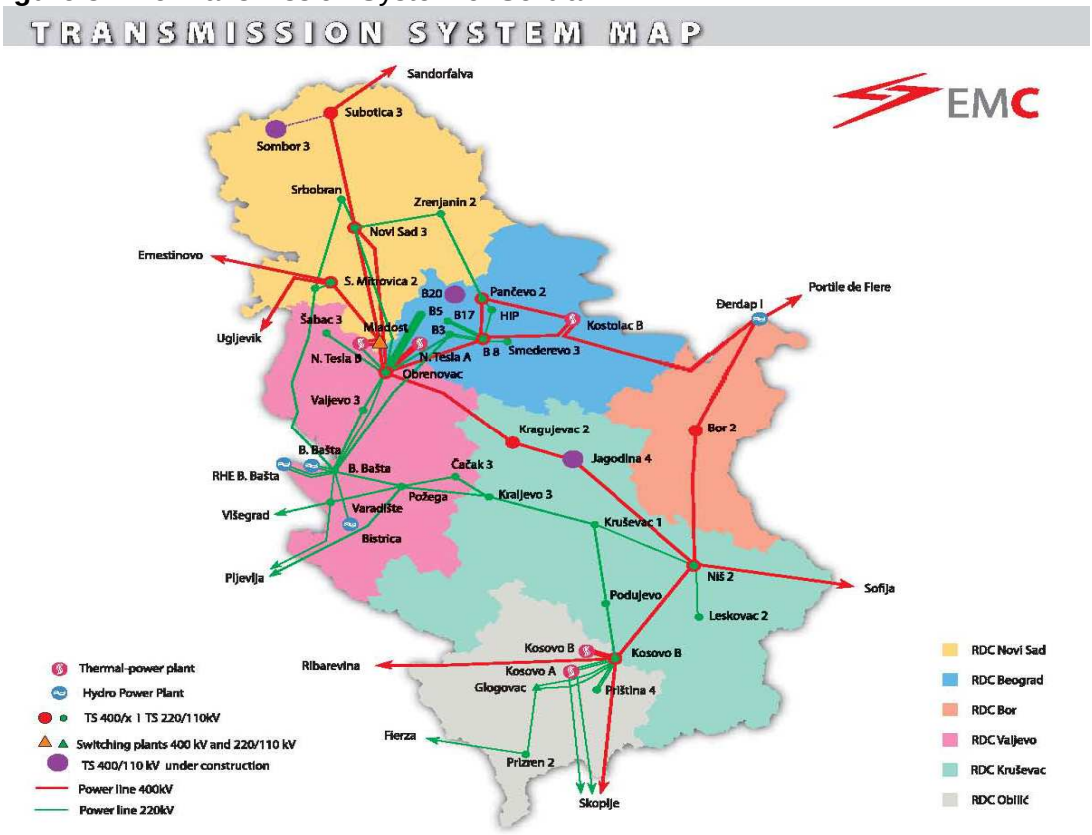
TRANSMISSION LINE		***SUBSTATIONS***			
	km	***Transmission ratio kV***	***No of installation pcs.***	***No of transformers pcs.***	***Installed power (MVA)***
440kV	1649.63	110/X	16	21	7150.0
220kV	2169.6	220/X	19	37	6131.5
110kV	5794.36	440/X	61	126	4050
35kV	246.45				
10kV	4.04				
Total	**9864.08**		**96**	**184**	**17331.5**

Source: EMS

In 2006 available power was 47,129GWh. EPS thermal power plants have injected 27,602GWh into the system, hydro power plants have injected 10,850GWh, and the rest have contributed 110GWh while 8,567GWh has been withdrawn from the neighbouring systems. Transmission losses were 1,296GWh (total loss rate 2.75%, on all voltage levels). On the end, total realised electricity power transmission (supply) was 45,834GWh. The transmission system of Serbia is shown in Figure 3.

[16] www.ems.co.yu

Figure 3: The Transmission System of Serbia



Source: EMS

The EMS pays exceptional attention to the investment cycle: the value of agreed projects amounts to 100 million euros at the moment, and funds are provided from credits and donations. From these funds, three new substations of voltage amounting to 400/110kV, and one transmission line of voltage amounting to 400kV would be built and a great number of existing substations in the transmission system would be rebuilt. By the end of 2005, a substation was expanded to 400kV in Sremska Mitrovica, and a new interconnected long-distance transmission line toward Ugljevik Thermal Power Plant in the Serb Republic was put into operation. This new transmission line (76km long) will increase electricity power transmission from the East to neighbouring countries in the West. In 2006 a new 400kV substation was built in Majur (near to Jagodina). Twelve million euros were invested in this project. The EMS continued investment in 2007 and at the end of this year, this company will start building a new international transmission line from Nis to Skopje and a new 400kV substation, 'Belgrade 20'.

4.3. Institutions

4.3.1. The Energy Agency

The Republic of Serbia formed the fundamental institutions for electric power operations. The Energy Agency (AERS) and the Energy Efficiency Agency are institutionalised. The Energy Agency is founded as a management body for electric power market promotion and orientation according to the principles against abuses of power and efficient competitiveness. The Agency is a legal entity that is independent of any government authorities and of electric power

subjects and users of their products and services. The Agency is administered by the Council of the Energy Agency.

The main tasks and issues of the Energy Agency are:

- electric power market promotion and orientation development;
- coordination of electric power subject's activities in providing regular power supply;
- providing protection and equal rights of consumers; and
- monitoring regulation implementation and electric power system working operation.

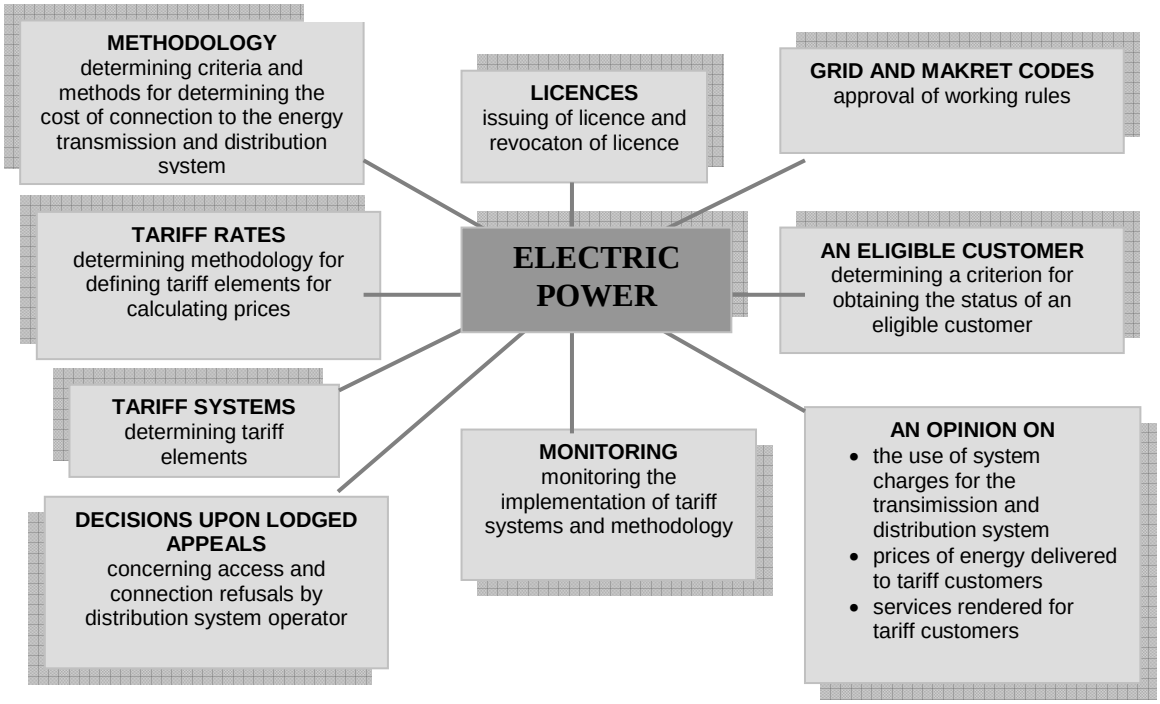
The activities of the Energy Agency are:

a. determining tariff systems for calculating electricity and natural gas prices for tariff customers, as well as tariff systems for access to and utilisation of the electric power transmission and distribution system;
b. determining tariff methods for calculating electricity and natural gas prices;
c. determining the criteria for terminal costs needed for electric power transmission, transportation and distribution;
d. issuing licences for carrying out electric power activities and passing an act on suspension of a licence;
e. giving its consent on working rules of the system and electric power market operation;
f. making decisions on an appeal against transmission, transportation and distribution operators;
g. determining minimum annual electric power consumption in order to get qualified (eligible) consumers' status and keep records of qualified (eligible) consumers.

Figure 4 shows the operations of the Agency with the power sector.

The Energy Agency adopted a methodology for determining tariff elements. The new tariff system will be valid from 1 April 2008. The issuing of licences is in progress and so far 65 licences have been granted. Electric power price and service methodology was passed for activity regulation in July 2006. Electric power methodology for determining connection charges to the system was passed in June. The EMS only prepare the power system and market tariff plan and is preparing the market operation plan. There is no interest in permission of qualified (eligible) consumers' status, while consideration of consumers' appeals is a permanent job. The preparation of a decree on an information report is in the final stage.

Figure 4: The Activities of the Energy Agency (Electric Power Sector)



It can be concluded that it is the responsibility of the Agency to help in the following: to improve and maintain safe energy supply; to protect consumers from monopoly of electric power operators; to improve the investment climate; to improve the efficiency of the electric power sector; and to quicken the process of European Union integration.[17]

4.3.2. The Energy Efficiency Agency

The Serbian Energy Efficiency Agency was originally founded by Government Decree and started its operation in 2002. According to the Energy Law and with financial support from the European Agency for Reconstruction, it was re-established in 2004 and thus was operating as a separate republic organisation. The operation of the Agency is financed through the budget of Serbia and as well by EU donations.

The establishment of the Energy Efficiency Agency is the result of the strategic need of Serbia to realise an efficient electric power system with reduced costs. To create 1$ of GDP, Serbia spends 3kWh of electricity power. Croatia and Slovenia spend less than 1kWh, while Greece, Italy and Austria even less – under 0.5kWh for the creation 1$ of GDP. Such inefficiency has an influence on economical inefficiency through competitiveness of Serbian products and services in the global market. The Energy Efficiency Agency is based on improvement of conditions for energy and conservation of energy products, as well as efficiency increase in energy conservation in all sectors of consumption. The main tasks of this agency are:

[17] www.aers.org.yu

- drafting proposals for measures and programmes to increase efficiency and the use of renewable energy sources;
- implementing measures for stimulating rational and efficiency use of energy;
- monitoring implementation, technical and other regulations for increasing efficiency; and
- providing financial and technical support in the preparation and implementation projects.

The agency acts through programmes of energy efficiency improvements in: building stock, industry, transport, CHP, renewable energy sources and the Serbian Energy Efficiency Project. An increase of electric power intensity, as well as promotion and stimulation of the use of new highly efficient technologies, should contribute to Serbia gaining greater electric power independence. Local environment development, loss reduction and improvement of safety of electric power feeding will be additionally stimulated by promotion of small and renewable energy sources, in other words, by the application of the distribution production model (a great number of small producers).[18]

4.4. The Electric Power Market

Besides the establishment of new institutions, Serbia built a legal framework for environmental protection and competitiveness. A law on the protection of competition was passed in September 2005. Monopolistic activities on the market are prohibited by this Law, but they still exist in practice.

Serbia is the central Balkan country and it has had a great impact the on electric power trade, because it cannot be avoided in transactions. If a dealer buys electric power in one country, and wants to sell it in another country in the region, that electric power has to go through the Serbian transmission system.[19] Most dealers come to this market because of electric power transit. It is expected that a significant electric power shortage will occur in 2012, caused by insufficient capacities against increasing consumption, the closing of two blocks of nuclear power plants in Bulgaria, and a dry year. Serbia has a problem with old and insufficient capacities. Bulgaria closed part of its nuclear power plant, and production was decreased. In previous years, the majority of the electricity deficit of South East European countries was covered by the closed blocks in Bulgaria. Bulgaria, Romania, and the Serb Republic have an electric power surplus, while Albania, Montenegro and Macedonia have an electric power shortage. Furthermore, Serbia and Bulgaria have balanced consumption, while Romania is an exporter of electric power. All other countries are importers. The region of South East Europe is dependent on electricity power imports. In this region there is a growing rate of consumption and a decreasing rate of production due to insufficient capacities. Besides this, price is one reason for the presence of so many dealers in this market. The price is lower in the summer time and higher in the winter time, due to higher consumption in winter than in summer. Based on this price difference, dealers expect high earnings. Today, there are fourteen companies that have a license

[18] http://www.mem.sr.gov.yu/prikazZaStampu.php?IDStranica=25&jezik=lat
[19] http://www.blic.co.yu/blic/arhiva/2007-01-20/strane/ekonomija.htm

for electric power trade in the electric power market in Serbia. These are the companies that can buy certain production capacity or a certain amount of electric power in the region or country. The Serbian Electric Power Industry is the only company, among these companies, whose founder is from this area. The EPS imported electric power from eight companies in 2006 (it is based on Public Procurement Law), and exported double this amount by means of many enterprises. The enterprises which are authorised for electric power trade in Serbia are shown in Table 8.

Table 8: Authorised Electric Power Traders in Serbia

NAME	FOUNDER OF COMPANY	COUNTRY
HSE BALKANA ENERGY	Holding Slovneske elektrane	Slovenia
Atel energija	AARE-Tessing AG	Switzerland
Energy financing team	EFT (Holdings) APS	Denmark
PCC Emergoka	Petro Carbo Chem GMBH	Germany
MC Invest Consulting	MC Invest AS	Czech Republic
EZPADA	EZPAD AG	Switzerland
Čez Serbia	ČEZ A.S.	Czech Republic
E.ON Slales&Trading SR	E.ON Slales&Trading SRL	Germany
EGL	EGL AD	Switzerland
Energy Holding SR	Energy Holding SRL	Romania
Sempra Energy Europe	Sempra Energy Trading	Holland
Istrabenz-Gorenje	Sempra Energy Europe	Slovenia
Korlea	Istrabenz-Gorenje	Slovakia
EPS	Government of the Republic of Serbia	Serbia

If the electricity power market is analysed through two segments of the market, wholesale (trading with high voltage) and retail (low voltage), the degree of development of each is that the wholesale market develops more than the retail market. Electric power dealers are not in competition with one another. The obstacle for real electric power market functioning is *low retail price of electric power,* which is dictated by the state and it does not cover production costs. According to the law there is the possibility that high load factor consumers choose their electric power suppliers.[20] There are about 360 enterprises in Serbia, which annually consume more than three million kilowatt hours and have a right to independently choose their electric power supplier. However, electric power price is low, so that they do not need to look for other electric power suppliers than EPS. Due to this, eligible consumers (companies that, as high load factor consumers, can buy electric power from whom they want) do not participate in the electric power market. The changes are expected in 2008, when Serbia is obliged to abolish the monopoly of state ownership in the electric power industry and to set conditions for the electric power market, that is, when this market is liberalised. From 2008, all customers, except household consumers, will be eligible, and from 2015 household consumers will also become eligible. In order that electric power traders can do business, apart from licence and registration of a company, the Serbian Power Transmission Company (EMS) has to allocate them a right for cross-border electric power transmission, that could not be bought up for

[20] Spalović D., 2007, *Struja na tržištu*, Politika, 4.3.07., str.14.

longer period, because the EMS allows transmission of a limited amount of electric power on a monthly level.

The Serbian Electric Power Industry is considered to be one of the most powerful electric power industries in the region and it has good economic potential to become a great dealer. The most is expected from the "Bajina Basta" reversible hydroelectric power plant. Electric power consumption is the lowest at night (at 3am), and the highest from 6pm to 8pm. Reversible hydro power plants bridge the gap between electric power generation and consumption in the best way. The "Bajina Basta" plant (two units of 300MW each) operates as follows: electric power is bought at low price at night, then that power is pumped to the lake, and finally it is sold early in the evening, when it is the most expensive because of the greatest demand. The difference between minimum and maximum electric power consumption in Serbia is about 2,000MW and "Bajina Basta" has a very important role in high profit-making during electric power trading. A kilowatt of electric power can be bought for about 2c€ at night. When the losses and pumping to the upper lake are included, the price amounts to 2.8c€ and it can be sold at 4c€/KWh as evening peak energy. In this way the price difference of 1.2 c€/KWh is made. [21]

4.5. Electric power generation from renewable energy sources and environmental protection area

European electric power plants, relying on renewable energy sources (solar energy, wind energy, biomass, natural gas, thermal energy), made a profit of about 417 million dollars last year. It is expected that profit will be 1.2 billion dollars by 2012. Serbia still does not have regulation on electric power generation from renewable energy sources, but it does have the capacity for this kind of power generation. The Serbian Electric Power Industry has plans to use its resources in hydro capacity exploitation of small water currents and is interested in constructing small hydroelectric power plants on Serbian Electric Power Industry-owned properties, or in the vicinity of these properties. Decision on investment of this project has not yet been passed.[22] There are about 860 sites suitable for construction of small hydroelectric power plants of power amounting to 10MW, which would make it possible to install power amounting to 455MW. That amount of energy would supply half of Belgrade, and in terms of generated energy it would be almost possible to supply Belgrade for two months. In terms of the whole of the Republic of Serbia, that energy would fulfil the requirements of 1/8 of Serbia, and in terms of energy amounts, would fulfil requirements for 15 days in Serbia.[23] Besides this, there is a huge thermal lake between Belgrade and Smederevska Palanka. By experts' opinion, this lake could heat the whole of Belgrade, but it is still unused.[24]

The sustainable development strategy, which will implement European Union economic legislation in the area of environmental protection, is in the process

[21] Obradović D., 2006, *Kupiš noću, prodaš danju,* časopis kWh, jun 2006, broj 389, str. 20. Miladin Basarić, director Sektora za planiranje proizvodnje EPS-a.
[22] http://www.eps.co.yu/razvoj.htm
[23] Mihajloic Milanovic Z., 2006, *Srbija- potencijal mali hidroelektrana,* www.energyobserver.com
[24] Lazarević M., 2006, *Vrelo jezero ispod Beograda,* časopis kWh, jun 2006, broj 389, str. 45.

of preparation. It is estimated that one third of planned funds for this strategy will be concentrated in the power sector.[25] In the past, attention was not paid to environmental protection and the preservation of natural resources in Serbia. There was a lack of conscience and responsibility for the environment, then the lack of financial aids. It was most important that there was no reduced production of coal and electric power in the Serbian economy. That policy resulted in the following: general destruction of water resources, air, and soil – all natural resources. As for environmental protection, Serbia lags about 40 years behind the developed countries of the European Union. It ought to be said that 30% of all Serbian activities, which must be fulfilled in order to integrate into the European Union, are connected with environmental regulations and standards and their implementation in practice.[26] Considering that pollution mostly comes from electric power generation capacities, the EPS initiated a lot of projects and activities connected with a solution to these problems from 2000 onwards.

Concentration of sulphur oxide and polluting particles significantly exceeds the permitted amounts in all blocks, and concentration of nitrogen oxide is above permitted amounts only in the blocks of installed power amounting to 300MW. The air quality has deteriorated in the vicinity of all thermal power plants because of polluting particles. Due to this, priority was given to the projects concerned with the reduction of polluting particles emission and with meeting the European Union demands for electro-filters' operation (on 50mg/m^3). Table 9 shows the estimated total amount of harmful substances for all thermal power plants for a year (during 6,000 hours of work), and the amounts after modernisation which would help to reduce emission of harmful substances of all thermal power blocks to the permitted level according to European Union regulation, together with estimated required funds.[27]

Table 9: Total Emissions from Thermal Power Stations of EPS (t/year)

	Situation before modernization	Situation after modernization	Funds Euro x 1000
Polluting particles	66.900	5.850	78.000
SO_2	360.440	40.720	385.000
NO_x	432.001	6.350	75.000
Total			538.000

Source: EPS, Gavrić M.

The electro-filter was built in Nikola Tesla thermal power plant A Unit 5 during 2004. The next projects, the projects of building in desulphuring plants and the other protection measures, are planned for 2009. During the overhaul of electric power plants, attention is concentrated on electro-filters, spraying systems for ash dumps and regular recultivation. The most important activity carried out was the capital overhaul of electro-filters in Units A-1 and A-3 in Nikola Tesla, and Unit 2 in Kostolac. The Serbian Electric Power Industry will carry out projects for environmental protection with money partly provided by

[25] EAR.
[26] *Ekologija je prioritet EPS-a*, NIN, Specijalni dodataka, 07.10.2005., strana 19.
[27] Gavrić M., *Nova politika u zaštiti životne sredine,* JP Elektroprivreda Srbije "EPS Environment Friendly"`, Drugi međunarodni sajam energetike, Beograd, 04.10.2006.

credits and equity capital, partly by the European Agency for Reconstruction (EAR).

4.6. Pricing Problems and the Tariff System

4.6.1 Pricing Problems

The financial position of EPS is very negative because of large debts from previous years (that are the consequences of the situation in the country and the low price of electric power). Electric power price is the key figure of the electric power industry's value. In order to keep social peace, the electric power price in Serbia is very low. Low price is an obstruction for the development of the EPS and the electricity power market. The electric power industry has a negative asset value as a result of the price amounting to 3.5c€/KWh (in 2006), or the price amounting to 4.5c€/KWh (in January 2007). The plan is that the price should be same as the price in neighbouring countries by the end of 2008. By increasing in price up to eight cents, asset value will amount to ten billion euros. It could be concluded, from the abovementioned details, that by increasing the electric power price to the amount of 0.5c€/KWh, the asset value of the electric power industry will increase by about 1 billion euros.[28] Moreover, if the price rises by 1c€, the EPS will obtain revenue of about 350 million euros per annum.

The EPS was asking for an increase in price in April 2007, but due to the unresolved political situation this price increase was postponed until 1 June 2007. The average demanded price increase was 20%. It is expected that the higher price of electric power will be about 5c€/KWh. In May, the newly elected Government gave approval for the price increase – a linear 15% for all customers. The new average price was 4.7c€/KWh and it is still in force. The price is two to three times cheaper than in neighbouring countries. For example, the price in Hungary is 10.6, in Albania 4.8, in Bulgaria 5.5, in Croatia 7.7 and in Bosnia and Herzegovina 6.1c€/KWh. If the EPS had not got approval for the price increase, it would have had a 176.5 million euro loss at the end of the year and it would have a negative balance of 223.1 million euros.

In August 2007, the EPS proposed a new price increase of 6.9%. In accordance with this suggestion, the price for household consumers would be increases by 1.9%, while the increase for industry would be more than 5%. The EPS submitted this proposal to the Energy Agency (AERS). However, after reviewing and checking justification of costs, the Energy Agency (AERS) recommended an average price increase of 4.9%. The EPS Board of Management accepted this recommendation. The next step was securing Government adoption of this suggestion, but it did not approve. One of reasons for rejection was fear of further increases of inflation and a decrease in the standard of living. The Government will discuss price increases in September 2007, but it is not clear if the price will rise until winter. Moreover, adoption of a new tariff system is postponed until 1 April 2008.

[28] Šaganović D., 2006, *Elektroprivreda: korporatizacija i/ili privatizacija*, Savetovanje ekonomista Srbije.

4.6.2 The Tariff System

Price formation in 'big systems' is often realised by means of commodity and service rates. Electric power price formation has its particularities. First of all, power generation costs per one kilowatt hour depend upon the kind of energy source (hydro power, atomic energy, thermal source, oil, gas, coal). Therefore, the price, which is charged to consumers, is different. Besides, the season and atmospheric conditions have an impact on power generation quantity, which reflects on individual costs, considering that fixed costs have a large impact on it. Even when production costs are given, electric power price is different in well elaborated tariff systems. The difference is made between high and low load factor consumers, between industrial consumers and household consumers, power consumption during summer and winter periods, daily consumption and consumption at night, peak consumption or periods of low consumption, and so on. A lot of other elements have an impact on electric power prices (installed power of devices, introduction of new equipment) meaning that the tariff system in the electric power industry is very complex and is subject to frequent changes. The necessity of electric power supply, as a condition of the expanded reproduction process, requires prompt and long-term planning of production capacities and the distribution grid, and it is necessary to bear in mind the economic development strategy in the long run. Connection and complementarity of certain energy forms make the pricing problem bigger, especially in the multi-national states with different development levels of certain regions and unfavourable economic structures. That problem is characteristic in Serbia.

Tariff systems are one of the most important elements of power sector reforms and are prerequisites for electric power market opening. Previous Serbian energy law had only one tariff system and that was for calculating electric power prices for (tariff) customers. According to the new Energy Law there are now three tariff systems:

1. a tariff system for access and utilisation of the electric power transmission system;
2. a tariff system for access and utilisation of the electric power distribution system; and
3. a tariff system for calculating the electric power prices for tariff customers.

They regulate price access and power grid utilisation, which enables customers to get the right to choose supplier (eligible customers), and to know how much they will pay for distribution, transmission and transportation grid utilisation. The significant innovation in the tariff system is the introduction of tariff customers as well as eligible customers. Tariff customers do not have the possibility of choosing their electric power supplier while eligible customers can. According to the Energy Agency, the key condition for price system reforms is the separation sector activities into production, wholesale, transmission, distribution and retail. Electric power enterprises determine their prices and estimated price is sent to the Energy Agency, and then, after the Agency states its opinion, it is sent to the Government in order to approve it.[29]

[29] http://www.aers.org.yu/Index.asp?a=612

4.6.2.1 The Tariff System for Calculating Electric Power Prices for Tariff Customers (postponed until 1 April 1 2008)

Due to this tariff system, tariff elements and tariff rates for calculating electric power prices are determined for tariff customers. Then, the way the electric power is calculated due to tariff rates is also determined, as well as categories and groups of tariff customers depending on the place to which it is imparted, the way it is measured and other characteristics of sold electric power. According to this tariff system, categories of customers are:

1. *High voltage consumption* (customers whose place of power delivery is on the high voltage distribution grid – *110kV or more*);
2. *Medium voltage consumption* (customers whose place of power delivery is on the distribution grid at a voltage level of *more than 1kV, and lower than 110kV);*
3. *Low voltage consumption* (customers whose place of power delivery is on the distribution grid at a voltage level *up to 1kV*);
4. *Mass consumption of power* (customers whose place of power delivery is on the distribution grid at a voltage level up to 1kV, but dependent on the electric power consumption purpose, *three groups of which* are determined: *1) household, 2) public and collective consumption and 3) other commercial consumption;*
5. *Public lighting* (customers who use electric power for street lighting, square lighting, tunnel lighting, pedestrian crossings, parks, roads, historical and other monuments, and so on. Depending upon the electric power consumption purpose, a special group of customers is determined – those using neon signs).

Tariff elements are accounting units to which the maximum approved income of the energy subject, which undertakes retail trade of electric power for tariff customers' needs, is added. Electric power prices for tariff customers are stated in tariff rates on account of which sold electric power is calculated for an accounting period and it is set according to tariff elements for each category and group of tariff customers. Tariff elements are: power, active energy, reactive energy and test site. Tariff rates are determined for each tariff element and according to categories and groups of customers.

For the tariff element 'active power', five tariff rates are determined which depend on the method of measurement, the part of the day when the electric power is used, and the purpose of electric power consumption. These are:

1. "higher daily tariff rate for active energy'' (from 7am to 11pm);
2. "lower daily tariff rate for active energy" (from midnight to 7am, and from 11pm to midnight every day, and it can also be determined between 10pm and midnight, provided that it lasts continuously eight hours);
3. "one-part tariff measurement";
4. "active energy – public lighting"; and
5. "active energy – neon sign".

For tariff customers from the mass consumption category (residential consumption), tariff rates for active energy are determined depending on quantity, purpose and how active energy was consumed:

1. "tariff rate for energy conservation" (monthly power consumption up to 350kWh – green zone);
2. "tariff rate for medium power consumption" (monthly power consumption from 350kWh to 1,600kWh – blue zone);
3. "tariff rate for excessive power consumption" (monthly power consumption over 1,600kWh – red zone).

For *public and collective consumption* two tariff rates and zones exist:

1. the green zone rate (up to 350kWh); and
2. the blue zone rate (over 350kWh).

Prices are calculated according to tariff rates for different categories of customers and their relative ratios are given. Prices according to tariff rates for electric power sale for all customers within the same category are equal throughout the Republic of Serbia.

EPS applied this new methodology when it asked for a price increase in August 2007. The Government did not allow that increase; so far prices from April 2007 are active. Table 10 shows the price list.

Table 10: Price List for Sale of Electricity Power (in force from 15 May 2007)

Category of consumption	Billing elements		Unit of measure	Daily tariff rate	RSD per unit of measure	Euro per unit of measure
1	2		3	4	5	6
1. High voltage	Power of account		kW		446.99	5.59
	Active energy		kWh	Higher	2.46	0.038
			kWh	Lower	0.82	0.010
	Reactive energy		kVArh		0.28	0.004
2. Medium voltage	Power of account		kW		446.99	5.59
	Active energy		kWh	Higher	2.46	0.038
			kWh	Lower	0.82	0.010
	Reactive energy		kVArh		0.28	0.004
3.Low voltage	Power of account		kW		546.48	6.831
	Active energy		kWh	Higher	2.89	0.036
			kWh	Lower	0.97	0.012
	Reactive energy		kVArh		0.83	0.010
4. Residential consumption (mass consumption)						
4.1.Consumers with built-in electricity limiting devices	Power of account		kW		87.29	1.09
	Fixed part		(2.16 kW)		188.53	2.357
	Active energy For single tariff consumers	For green zone	kWh		2.78	0.035
		For blue	kWh		3.98	0.050

		zone				
		For red zone	kWh		7.84	0.098
		For green zone	kWh	Higher	3.17	0.039
			kWh	Lower	0.79	0.000
	For double tariff consumers	For blue zone	kWh	Higher	4.54	0.057
			kWh	Lower	1.14	0.014
		For red zone	kWh	Higher	8.97	0.112
			kWh	Lower	2.24	0.028
	For consumers with controlled consumption	For green zone	kWh	Higher	3.17	0.039
			kWh	Lower	0.79	0.000
		For blue zone	kWh	Higher	3.63	0.045
				Lower	0.91	0.011
		For red zone	kWh	Higher	7.18	0.089
			kWh	Lower	1.79	0.022
	For controlled consumption with special measuring (DTC)	For green zone	kWh		0.79	0.000
		For blue zone	kWh		1.14	0.014
		For red zone	kWh		2.24	0.028
4.2.Consumers without built-in electricity limiting devices	Fixed part		(2.16 kW)		188.53	2.357
	Active energy					
	For single tariff consumers	For green zone	kWh		3.33	0.042
		For blue zone	kWh		4.77	0.059
		For red zone	kWh		9.42	0.118
	For double tariff consumers	For green zone	kWh	Higher	3.81	0.048
			kWh	Lower	0.95	0.012
		For blue zone	kWh	Higher	5.45	0.068
			kWh	Lower	1.37	0.017
		For red zone	kWh	Higher	10.76	0.135
			kWh	Lower	2.69	0.034
	For consumers with controlled consumption	For green zone	kWh	Higher	3.81	0.048
			kWh	Lower	0.95	0.012
		For blue zone	kWh	Higher	4.37	0.055
			kWh	Lower	1.08	0.014
		For red zone	kWh	Higher	8.61	0.108
			kWh	Lower	2.16	0.027
	For controlled consumption with special measuring (DTC)	For green zone	kWh		0.95	0.012
		For blue zone	kWh		1.37	0.017
		For red zone	kWh		2.69	0.034
	For neon signs		kWh		4.77	0.059
5.Public lighting	Active energy		kWh		3.70	0.046

Source: EPS

Note: exchange rate 1 Euro=80 RSD

5. Future Development of the Serbian Electric Power Industry

The electricity power sector is a strategic state owned resource. This sector has much potential for development because it stimulates investments and has influence on the strategic, economical, technological and social development of economy. Serbia has an inefficient electricity power sector and it is in need of restructuring. The main stress is made on EPS future development. Therefore, last year, the European Agency for Reconstruction invited bids for

selection of a consultant for power sector restructuring and in addition the Serbian Electric Power Industry (EPS) invited bids for engaging a consultant for the company's restructuring. It is asserted in the Serbian Electric Power Industry that consultants of the European Agency for Reconstruction and those that will be engaged by EPS will not have the same task. A consultant engaged by EPS should take care of problems concerning organisational, financial and investment programmes improvement in the company, while the European Agency for Reconstruction, in agreement with the Serbian Government, should choose a consultant that will help the restructuring of the complete power sector. In that sense, the aim of the bid financed by the European Agency for Reconstruction is the separation of the main line of business of the Serbian Electric Power Industry, the establishment of a market and tariff system, in other words, electric power trade. Details concerned with foreign capital investment, general analysis of position and organisation of the company are especially important. On the other hand, the Serbian Electric Power Industry's bid should make possible the continuation of construction of Kolubara B Thermal Power Plant, which was predicted by the operating plan for the defined strategy in connection with reform changes and the Serbian Electric Power Industry's development by 2015, as well as a series of activities that are not mentioned in the bid of the European Agency for Reconstruction. [30]

According to capital estimate and the number of employees (34,651 at the beginning of 2007), the Serbian Electric Power Industry is the largest enterprise in Serbia. Its capacity in the commercial market is very high. Its estimated value is more than 20 billion euros. For a further value increase, conditions are to change the status of the enterprise from public to joint stock, to issue securities and attract strategic partners. Yet the electric power industry's business operation is impossible to commercialise fast. It requires time and is a medium-term plan of the Serbian Electric Power Industry.

In Serbia there are several completely opposite opinions about the future of EPS. According to some political parties, poor financial and inefficient performances of the EPS are consequences of badly run public enterprises by the Government. The Serbian Electric Power Industry has very old equity and has a lack of capital. Also, Serbia as an economy has significant external debts, inefficient public enterprises and a great number of employees. A solution for those problems is privatisation and sale. In that way foreign experts with more experience and knowledge in running this kind of company will come and increase economic performances. Moreover, with the sale, there will be an inflow of capital, an increase of investment and repayment of debts. In accordance with this policy is unbundling generation, transmission and distribution, and their privatisation should go as it has gone in Bulgaria, Romania and Macedonia. However, there are other parties with a different opinion. They agree that the Serbian Electric Power Industry has a poor financial position, but if the electricity price were to increase, to be similar to neighbouring countries' prices, and could cover all costs, this company could stay 100% in state ownership and become efficient, gain new capital and raise

[30] Benković S., Jednak S., »Restrukturiranje javnih preduzeća u Republici Srbiji«, X Internacionalni Simpozijum iz project managementa „Projektno upravljanje organizacijima – novi pristupi, YUPMA, maj 2006, Zbornik radova.

investments. According to this policy, another solution is that the state be the majority owner in the Serbian Electric Power Industry. There is a suggestion for privatisation where 51% would be state owned, 19% would be sold to strategic partners, 15% would be split to employees and pensioners, and 15 % would be split to residents. Also, there is an opinion that transmission and distribution should be natural monopolies and controlled and regulated by the state. The remaining activities should be subject to market competitiveness. Today's Government policy is that this enterprise needs first to be restructured, then found a strategic partner, but still not to be privatised.

6. Conclusion

The Serbian electric power sector has its advantages: favourable capacity structure for electric power generation (1/3 hydro and 2/3 thermal on lignite); favourable natural conditions – hydro potential and coal (lignite); central geographical position in the region; good connection of electric power transmission systems with neighbouring countries; and educated and skilled human resources. However, the electric power system has its disadvantages, too. The electric power infrastructure in Serbia, by the opinion of experts, became technologically obsolete, and for its reconstruction significant investments are necessary. Also, operative efficiency is at a very low level. Poor political running of this sector and damage of infrastructure in 1999 caused this situation. European Union countries made possible the revitalisation of existing Serbian capacities and stabilisation of coal and electricity power generation by investing over 400 million euros since 2001.[31] However, Serbia needed to start up the reform process in this sector. The first move was the restructuring of public utilities in 2003. The next step was signing the Athens Memorandum in 2002 and in 2003. Upon doing this, Serbia adopted the Energy Law in 2004. The law comprises 'guidelines' for the reform process of the power sector. The latest move was signing the ECSEE Treaty in 2005.

Serbia, as well as other South East European countries, committed itself to creating a regional power market. This process started with the development of the electricity and gas market and later resulted in the Energy Community formation. The ultimate aim is incorporating the integrated South East Europe power market into the EU internal power market. States committed to adopt EU legalisation on:

- *energy* – creation of an internal electricity and gas market, access to the network for cross-border exchanges in electricity, policy to conserve energy;
- *competition* – conditions for free competition in the market (liberalisation);
- *environment* – prevention of environmental damage by power sector activities; and
- *renewables* – making use of renewable energy sources.

[31] Djordjevic, 2007, *Donacije ustupaju mesto komercijalnim kreditima,* Danas, 30 April 2007.

Power sector reforms in Serbia have been started. Certain results were achieved in several aspects of electricity power reform:

a. *Corporatisation and unbundling of state owned utilities.* The beginning of this process was in 2003, when subsidiary activities were derived from core activities (generation, distribution, transmission). In 2005, one public utility was split into two companies: the EPS (generation and distribution of electricity power, sale and coal production), and the EMS (electric power transmission). Both companies are 100% state owned.
b. *The Energy Law* was adopted, but there are no secondary regulations.
c. *The Energy Sector Development Strategy* was adopted in 2007. The strategy has five priorities that should remain till 2015.
d. *Institutions.* The Energy Agency (AERS), Energy Efficiency Agency and the market operator (the EMS) were founded in 2004.
e. *The electricity power market and liberalisation.* The electricity power market is open. There are fourteen companies that have a license for trading in electric power. Also there are 360 companies with eligibility status that purchase electricity power from the EPS. The reason is low price of electricity power (the lowest in region). In this way EPS has a monopoly position and there is no competition. Change should happen in 2008, when the EPS need to abolish the monopoly position and when all consumers will be eligible except households. Households will obtain that right from 2015.
f. *Tariff system and price.* New tariff systems were adopted in 2006. The innovation was three tariff systems (for power transmission system, for distribution system and for tariff customers). Their application was first postponed until September 2007 then until April 2008. According to the new tariff system there is a new methodology of setting price;
g. Investment *and restructuring.* The EPS engaged a consultant for company restructuring. Furthermore, the EPS is looking for a strategic partner in projects, construction of thermal power plants amounting to 700MW, and reconstruction of CHP. Besides those large investments there are investments for revitalisation, capacity modernisation, distribution and transmission system, mines, maintenance, environmental protection;
h. *Privatisation*. In countries in transition there are several models of privatisation of electric power utilities. One of them is privatisation of production capacities, that is, electric power plants, which for a certain period of time be kept in state ownership; the other is privatisation of distribution companies, while the electric power transmission systems are kept in state ownership. Serbia has not yet clearly decided which model will be applied and when the EPS will be privatised.

i. *Renewables* – Serbia will provide two directives on the use of renewable energy sources. The EPS is planning to increase power generation introducing small hydro power plants into its generation power capacities;
j. *Environment* – Environmental protection is at a low level. Some regulations have been adopted. There is a need for large investments to decrease pollution.

Both the active participation of the state and investments are necessary for the continuation of reforms. Future decisions would mostly depend on the political situation. Political parties have a dilemma: on the one hand, the reform process should be implemented; but on the other hand, changes could have an influence on social welfare. However, considering commitments and aspiration to the European Union, the state should be determined to carry out uncompleted objectives of the Energy Law and the Energy Development Strategy.

References

1. Delić M., Kragulj D., 2005, *Objectives of Macroeconomics as the Basis for Clustering of Countries in Integrated Europe,* The 7th Balkan Conference on Operational Research, Volume of Abstracts, Constanta, Romania, 25-28 May 2005
2. Directive 96/92/EC on internal electric power market in European Union
3. Djordjevic V., 2007, *Donacije ustupaju mesto komercijalnim kreditima,* Danas, 30 April 2007
4. *Ecology is the priority of Serbian Electric Power Industry,* NIN, special supplement, 10 October 2005
5. *Electric Power Policy in European Union and Serbia, 2006, Putokaz* magazine for points of law, political and cultural questions to European Integration, November 2006, pages 17 -27, ISSN 145-5348
6. *Energy Balance of Electric and Thermal Power,* 2004 and 2005, (2006), Working document, the Republic of Serbia – Republic Bureau of statistics, ISSN 1820-0141, September 2006, http://webrzs.statserb.sr.gov.yu/axd/rdokumenti/rd53g06.pdf
7. EPS ICAS – BBP, Project ID No: 002/001/2006
8. Gavrić M., *New policy in environmental protection,* public company Electric Power Industry of Serbia "EPS Environment Friendly", The Second International Fair of Electric Power, Belgrade, 4 October 2006
9. Annual statement of Electric Power Industry of Serbia
10. Hofman E., *Advisory Report on Power Sector Development in Serbia and Montenegro in the context of Stabilization and European Union Integration*, AIA report SCEPP-a, No. 10, 2003
11. http://pks.komora.net/PrivredauSrbiji/Privrednegrane/Energetika/Energetskibilans/tabid/310/Default.aspx
12. http://www.aers.org.yu/Index.asp?a=612
13. http://www.blic.co.yu/blic/arhiva/2006-10-26/strane/ekonomija.htm
14. http://www.blic.co.yu/blic/arhiva/2007-01-20/strane/ekonomija.htm
15. http://www.dnevnik.co.yu/arhiva/07-10-2003/Strane/drustvo.htm
16. http://www.ekonomskitim.sr.gov.yu/mediji_lat.php?id=060525_1
17. http://www.eps.co.yu/razvoj.htm
18. http://www.eps.co.yu/zaposetioce/cene.htm
19. http://www.mem.sr.gov.yu/prikazZaStampu.php?IDStranica=25&jezik=lat
20. http://www.obrenovac.org/privreda/tent/index.htm
21. Kragulj D., Delić M., 2005, *On Global Economic Flows in European Countries in Transition,* 2 ND Second Pan-Hellenic Conference on International Political Economy, „Global Political Economy and the New Challenges for Development", Athens, September, 2005
22. Kragulj D., Jednak S., 2005, *Reconstruction of the Western Balkans in the Process of European Integration*, The Ninth Internationl Symposium from project management, Collection of papers, YUPMA, Zlatibor, 2005
23. Lazarević M., 2006, *Vrelo jezero ispod Beograda,* magazine kWh, June 2006, No.389
24. Mihajlovic Milanovic Z., 2006, *Serbia –small hydroelectric power capacity,* www.energyobserver.com
25. Serbian Ministry of Economy – brochure, March 2006, www.mpriv.sr.gov.yu
26. Obradović D., 2006, *Kupiš noću, prodaš danju,* magazine kWh, June 2006, No. 389, page 20. Miladin Basarić, a director of Production Plan Sector of Serbian Electric Power Industry.
27. Obradović D., 2006, *Razvoj uz strani kapital,* magazine kWh, No. 388, page 17.
28. Benković S., Jednak S., *Restructuring of Public Companies in the Republic of*

Serbia, The 10th International Symposium from project management on “Project Management of Organizations – new approaches, YUPMA, May 2006, collection of papers
29. Jednak S., Benković S., *Restructuring of Power Sector in Serbia*, The 10th International Symposium on “Organization and Management Changes – European Integration Challenges”, SYMORG 2006, June 2006, Collection of papers CD.
30. 'The Official Gazette of the Republic of Serbia”, No. 84/04
31. Spalović D., 2007, *Struja na tržištu*, *Politika* newspapers, 4 March 2007, page 14.
32. *Statistical Yearbook* of the Republic of Serbia for 2006
33. *Electric Power Development Strategy of the Republic of Serbia by 2015,* 2005*,* Termotehnika No.1-2, year XXXI, 3-70.
34. Tanić G., 2001, *Electric power and market,* EPS, ISBN 86-7302-003-4
35. *To 2060 – without fear,* NIN, special supplement*,* 2005
36. Šaganović D., 2006, *Electric Power Industry*: *corporatism and/or privatisation*, Consultation of economists in Serbia.
37. Vidović L., 2004, *Privatisation and ownership of electric power plants*, Balkan Energy solutions Team, No. 9 ISSN 1820-0419 www.balkanenergy.com
38. www.aers.org.yu
39. www.ear.eu.int
40. www.ems.co.yu
41. www.eps.co.yu
42. Energy Law from 2004