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# Energy potential of Republic of Serbia as an Investment Opportunity

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**Abstract**

*Serbia has a big potential to accomplish the goal of making the environment green and comfortable for living. It started with reforms in comprehensive Energy Sector and set up a new Energy Policy in accordance with the EU practice and standards. With new national policy, Serbia became aware of middle-term and long-term strategies for developing of adequate Power Sectors. There were investments into the Network and there are plans for building new and expanding existing transforming stations, building new interconnecting line and making some other investments. Having in mind the cooperation with EU, Service for Electrical Energy Market Development has already prepared wide range of available services related to market and deregulation of network, from requirements for connecting to transmission line to securing balance mechanism, and that makes possible for international Electrical Power market to exist. Since the production system is unable to respond to the demand in certain moments of time and Serbia has to import Electrical Energy that makes Renewable Energy Sources very attractive for use in Power system. Deficit of electrical power must be covered either by import or by more intensive investments in new production capacities, making Serbian energy sector economically interesting.*

**Keywords**: Energy potential, Investment, Renewable energy, Serbia

**JEL Classification:** Q40, Q48, H54.

## 1. Introduction

Serbia is a country located in south-eastern Europe, but it is also a country aware of its turbulent history where a lot has been lost. Now, efforts are being given for catching up with all European standards in order to become a part of the European Union.

Besides good will, Serbia has a big potential to accomplish the goal of making the environment green and comfortable for living. We are aware of limited sources of coil, bad influence of Thermo-power Plants and unavoidable passive pollution caused by Hydropower Plants. Since our Power System is based on these two types of power production and with appreciation to the latest studies and trends of European Union in energy sector, we had adopted and accepted standards which were declared by *EU Energy Agency* as well as goals that EU towards to. Practically, we have started with reforms in comprehensive Energy Sector and set up a new Energy Policy in accordance with the EU practice and standards.

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In the year 2005 Government of Serbia made the first move by reorganizing of Public Enterprise "Electrical power industry of Serbia" into two: "Electrical power industry of Serbia" (EPS) - with reduced authority over power generation (with whole accompanying sector), electric power distribution and management, and electric power trade, and into "Power Networks of Serbia" (EMS) - with authority over electrical power transmission, trade of transmitted electrical power and transmission system control. Also, speaking of Renewable Energy and Energy Efficiency most important EU directives that have been adopted are 2001/77/EC and 2009/28/EC. Serbia became a member and founder of International Renewable Energy Agency (IRENA) and the first intergovernmental organization, focused on Renewable Energy Sources.

With new national policy, Serbia became aware of middle-term and long-term strategies for developing of adequate Power Sectors, including private domestic and foreign investments safety in new or existing Power units.

## 2. Power system of Serbia

Serbian power system is relatively well branched system with good connections to nearby countries. It is well networked in European interconnectivity system UCTE and constantly taking part in international trade of electrical energy.

### 2.1. Power plants

Power Plants in Serbia are Thermo-powered and Hydro-powered. Also, there is a small number of Thermo Power Plants – Boiling Plants, powered by natural gas and fossil fuels with possibility of Electrical Power production out of heating season. Total installed power of Power Plants is 8.359 MW including capacities in Serbian Autonomous Province of Kosovo and Metohija, that is 7120 MW just within territory of Serbia. Our major production is based on Thermo-power Plants with 5.171 MW (just Serbia 3936 MW) of installed power and mostly lignite coil as primary energent. Peaks of daily and season consumption are being covered by Hydro-power Plants, which have 2.831 MW of installed power. And, there are Thermo Power Plants – Boiling Plants with negligible installed power of 353 MW. All Power Plants are owned by EPS. It is important to highlight that Reversible Hydro-power Plant Bajina Bašta has 614 MW of installed power and important capabilities to stuff Daily Consumption Diagram of Electrical Energy by producing power and keeping Thermo-power Plants running during low consumption by pumping the water into the dam and so acting as a load to the system.

Altogether eight Thermo-power plants (TPs) with 25 blocks are divided into two organizations TP "Nikola Tesla" and TP "Kostolac". TPs of each organization are based mostly on lignite coil as primary energent, where lignite makes 92% of national reserves. Both organizations have their own surface mining where the coil is being dug out of.

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Currently average age of equipment in mines is about 20 years and requires investments. Some of them were already made with goal to revitalize mines successively. These actions directly amplified capacities of coil production as well as of electrical power indirectly.

During the year of 2008 25.019 GWh were produced in TPs, where, to accomplish this production, amount of almost 38 million tons of lignite were burned. This dimension of production is closing up to the maximal limit of Thermo-power capacities, where last TP was built back in 1991.

It means that weighted unit of TP has worked 173.615 h (almost 20 years) on average. In the past period activities related to infrastructure were aimed more to revitalization of already built capacities and less to building new facilities. Revitalization is directed to improvement of generators and especially to the following equipment such are turbines, equipment for measuring and regulation, etc, with the focus on renewing and improving systems for environment protection. This is to reach gain in power production, improve energy efficiency and reach higher standard of living. In some facilities this led to higher production of power after reparation then when the facilities were originally built. Also, there is plan for building two new Thermo-Power Plants of 1.400 MW of installed power. Recently pre-contract has been signed up with China National Machinery & equipment Import & Export Corporation to build the first 700 MW. Other 700 MW are in building process and up to now about 40% has been built where the rest of building is planned to be realized through investment from strategic partners. Also, revitalization of Thermo Power Plant – Boiling Plant in Novi Sad is planned as well. It should be done by common investment of EPS and strategy partners, too. EPS owns 9 Hydro-power Plants (HPs) with 50 hydro-aggregates which is 34% of Electrical potential of Serbia. There are three categories of them: The run-of-the river, Storage and one Reversible Hydro-power Plant.

11.093 GWh was produced in HPs in the year 2008. They are important part of Serbian Power System since they regulate all demands in consumption, which are very various, keeping the system delivering quality Electrical Energy. Technically usable Serbian Hydro Power potential is about 17.000 GWh per year of which up to now about 10.000 GWh is activated. Nearly 5.000 GWh is available in plants with over 10 MW of installed power, while rest of 2.000 GWh is available in plants under 10 MW. Most of unused hydro potential is located on the river of Drina in west Serbia, on the border with Serbian Republic.

On the other hand, the average age of one Hydro-power Plant at the end of 2007 was 33.3 years, making them very old. That is why revitalization of HPs is very important topic for EPS. Revitalization of Reversible Hydro-power Plant Bajina Bašta is planned to be done by 2012 and is joint investment of Kf W Bank and EPS. Its capacity will be about 10% stronger afterwards. Also, HP Đerdap is in process of revitalization but none of important work has been done yet.

There are two HPs with all necessary documentation waiting to be built: Brodarevo with 51 MW of installed power and 190 GWh of energy production per year and Ribarići with 46.7 MW and 76 GWh, respectively. The only missing thing to realize these projects is investment.

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## 2.2. Transmission network

Lower Government investments during 1990s and devastation of transmission system objects in NATO bombing had been added to their deterioration. Considering Transmission Network, Serbia has 9.850 km of transmission lines with 400 kV, 220 kV and 110 kV voltages and installed power of nearly 18.000 MVA. The Transmission Network is of average age. Lines of 220 kV were built in 1968 (building started in 1960) while building of lines of 400 kV started in 1970. Public Enterprise "Power Networks of Serbia" (PNS), in charge of the transmission network, is trying to keep up with top-technology, so latest systems and equipment as SCADA system of monitoring and control are already in use. Also, there is an aim to fully improve remote system of transmission tracking and accounting measured data.

For that reason there were investments into the Network. EBRD approved loan of 60 million euro for year 2008 for purpose of building new and expansion of existing transforming stations 400/110 kV, as well as building new 400 kV and reconstruction of existing 110 kV lines. Also, EIB approved loan of 60 million euro for reconstruction of existing biggest vital transforming stations and loan of 31 million euro for improving new telecommunication system. It should not be forgotten that considerable amounts of donations were made by EAP (21 million euro) and by Government of Switzerland (15.3 million euro) for building new interconnecting transmission line, rehabilitation of Serbian National Dispatching Center and projecting controlling system for electrical energy market.

Currently, there are plans for building new and expanding existing transforming stations, building new interconnecting line, etc. Just in period from 2006 to 2015 the sum of 350 million euro has been planned for improving system performances and getting the leading role in south-eastern Europe as well as for projects for environmental protection. Because of all these reasons the biggest investment in transmission network in Europe nowadays and in close future are in Serbia.

PNS is organized as two services: Electrical Energy Market Development and Commercial Scheduling. Having in mind the cooperation with EU, Service for Electrical Energy Market Development has already prepared wide range of available services related to market and deregulation of network, from requirements for connecting to transmission line to securing balance mechanism. That makes possible for international Electrical Power market to exist.

## 2.3. Consumption of electrical energy

In the last report given by EPS (for year 2008) stands that 36.579 GWh of energy was produced while consumption was 33.697 GWh in gross or 32.186 GWh in net. The percentage of loss in distributive system was 3,63% while the loss in transmission system was 2,79%.

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The dominant category of energy consumption in Serbia consists of households. They participate in consumption with 53.07% (for 2008). Over last twenty years Serbian economy has been slowly decreasing its capacities of industrial production, mostly because of current sanctions.
Therefore, industry in Serbia is not taking major place in consumption as it should be in a developed country. But, in prior time foreign investors have been coming and that trend continues. On the other hand privatization of commune companies is coming to an end; therefore it is quite realistic to expect rapid increase in consumption in near future.

Due to the facts about the consumption of electrical power in Serbia, EPS is expecting an increase in electrical energy consumption in industrial sector by amount of 2.7% per year until the year 2015 and its relative stability. In very same period of time average rise of overall electrical energy consumption is predicted to be about 0.9% with about 0.5% increase of demanded power peak, per year. All predictions were made with evaluation of macro-economical parameters of economical development of Republic of Serbia until year 2015, considering planed effects for rationalization of electrical power consumption, according to the State Energy Efficiency Plan. With these predictions final consumption in 2015 should be about 35.480 GWh compared to 32.473 GWh in year 2008. Because of this and because of stochastic schedule of hydro system, which makes planning and exploiting of it hardly predictable, every year TPs, as primary power source, are setting new records in production. But it's getting close to the maximum of theirs possible production. On the other hand, due to unsteady consumption and its peaks, production system is unable to respond to the demand in certain moments of time and then Serbia has to import Electrical Energy. This makes Renewable Energy Sources very attractive for use in Power system because it can provide additional energy in consumption peaks. For example, in summer period during very hot days consumption can reach relative maximum due to air-conditioning systems. Unfortunately, Hydro-power Plants usually cannot provide enough energy because of low water level. On the other hand, in that particular time solar panels reach their yearly production zenith making them very convenient for covering consumption peaks. For that purpose, wind energy is not negligible too.

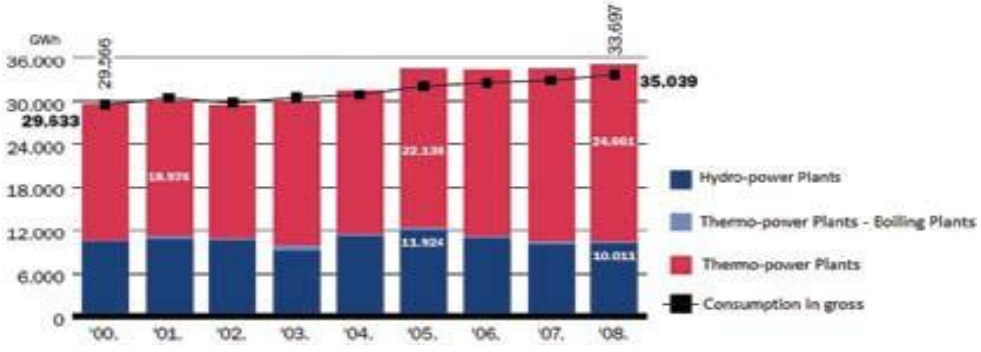


Fig.1: Structure of production and consumption in gross

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On the diagram below we can see the increase in Electrical Energy consumption in Serbia up to year 2015, by mentioned prediction:

It is also worth mentioning that Serbia has adopted policy about Rationalization in Electrical Energy Consumption. It should balance requirements over consumption and possibilities of EPS production. Basic austerity measures are:

- Increasing price of electrical energy and balancing prices of primary energents
- Substitution of electrical energy use for heating by other energents
- Decreasing losses of electrical energy in distributing sector
- Decreasing self-consumption in Power-plants and other system objects
- Stimulating the use of energy efficient devices and materials

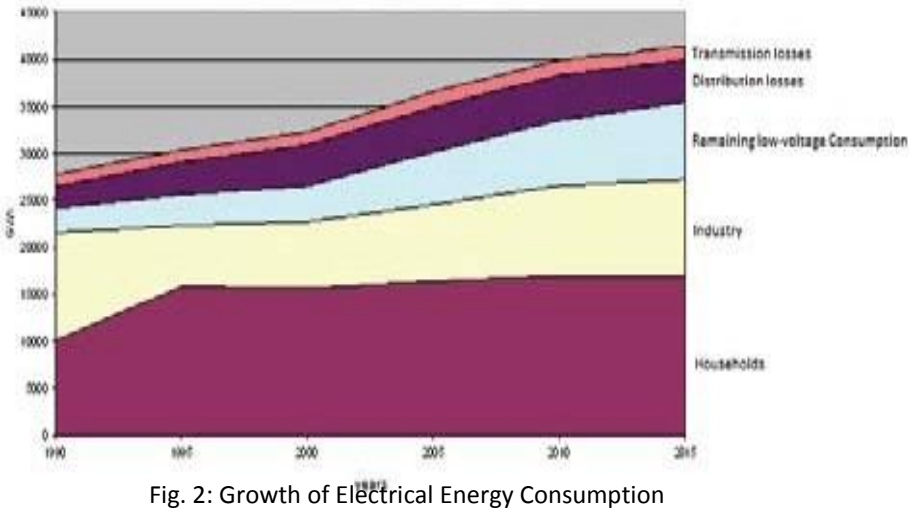


Fig. 2: Growth of Electrical Energy Consumption

All these austerity measures are aimed to increase social conscience over electrical energy consumption and to make place for alternative sources of energy to come.

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## 3. Conclusion

Government is aware of consequences that conventional electrical power production brings. On the other hand, undeniable rise of consumption and certain development of industry are present and soon coming and that will demand more and more power produce. To respond to this, Government is trying to insure power resources. Therefore, EPS has founded joint company with Energy Company of Serb Republic, in order to build several Hydro-power Plants on the river of Drina. Also, building of new Thermo-power Plant is quite realistic and is about to happen. But, making these steps draws the questions of human health and green environment.

Luckily or unluckily for Serbian citizens only one Thermo-power Plant and a few Hydro-power Plants are possible to be build. Building of these will cover consumption demands over next thirty years but it still does not solve Serbian requirements for energy in the long therm. This makes it possible for breakthrough in Electrical Power generated out of Renewable Energy Sources to happen. By minor action of increasing social consciousness and already accepted declarations it would be real too. Thanks to our highly competent experts in the corresponding areas of interests it should be presented and accepted by society in reasonable period of time.

Also, generally transmission system is in good shape with enormous potential regarding advantageous position of Serbia in region. Besides bare potentials, EMS worked on procedures for making power international trade possible and easy to do. That makes power trade for power producers even more attractive and beneficial because, besides Serbian market, it brings foreign markets in the market game.

In corresponding conditions of planned revitalizations and modernizations in all parts of the system and even mines whose reserves are slowly coming to an end, predictions about tendency of continual consumption increase are present. This deficit of electrical power must be covered either by import or by more intensive investments in new production capacities, making Serbian energy sector economically interesting.

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