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Review paper

PERSPECTIVES OF RENEWABLE ENERGY UTILIZATION IN THE REPUBLIC OF SERBIA *

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Abstract. *Energy crisis, reduced supplies of fossil fuels and enormous pollution of the planet caused many countries to turn to alternative sources of energy, especially renewable energy. To ensure energy security and economic competitiveness, and reduce negative impacts on the environment, the Republic of Serbia needs to make significant efforts towards the promotion and utilization of renewable energy and energy efficiency in all energy sectors.*
This paper tries to show the benefits of using renewable energy sources, in order to raise awareness about the importance of obtaining energy from these sources. This will improve the quality of the environment and reduce dependence on imported energy. This paper will also give an overview of the status and potential of renewable energy sources, a brief description of certain incentive measures with reference to international conventions, agreements and conditions of accession of the Republic of Serbia to the European Union related to the use of renewable energy sources.

Key Words: *renewable energy, energy security, energy efficiency, dependence on imported fossil fuels, incentive measures, the Republic of Serbia, the European Union.*

INTRODUCTION

The economic and energy crisis in the world, among many issues of development, also opened the issue of security of energy supply. The problem of security of energy supply has become an important topic in conditions of high demand for them. In the crisis situations, the state may respond to the shortage by activating its own reserves. However, due to limitations

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of its own reserves, such measure is of short-term nature. Because of that, the states opt for measures that have long-term character. Therefore states, which on the international market mainly occur as importers (buyers) of energy, concluded long-term contracts on the delivery of energy. Such contracts should ensure security of supply in accordance with the commitments of the contracting parties (contracted volume, level of price, options, etc.). Although the contracts have private law character, due to the subject of purchase, it is common to observe the public legal aspect too. Namely, it is possible that there are problems in implementing the contract for many reasons. Another possibility that states resort to is raising their own produce from conventional sources, if conditions permit, i.e. creating conditions for the use of renewable energy sources (RES). In both cases, the state is faced with many problems. Raising the level of production from conventional sources often requires new research, investments, building and modernization of infrastructure, which calls into question the sustainability and viability of undertaking such ventures, bearing in mind the more stringent regulations on environmental protection, reducing greenhouse gas emissions, and a tendency to replace conventional with renewable sources. On the other hand, production of energy from renewable sources implies the existence of geographic potentials, developed agriculture and related industries, and in the case of some countries such as ours, and development of legislation that will improve the whole process.

Today, all the EU member states already use renewable energy sources for energy purposes. In the course of the accession of the Republic of Serbia to the EU, its use here will actually be more spread. The EU accession process requires, among other things, the harmonization of legislation of the candidate country with the EU law. This means that the energy policy of the Republic of Serbia must comply with the EU energy policy. For this reason, the Energy Law was adopted last year. By signing the Treaty on establishing the Energy Community of the Southeast Europe and the Treaty on EU in 2006, the Republic of Serbia has accepted the obligation to implement directives related to the use of renewable energy. The Republic of Serbia also had to give an unambiguous signal of its commitment to renewable energy sources by signing a contract, which it did in 2007 by the ratification of the Kyoto Protocol. As the Annex I does not concern the Republic of Serbia, it has no specific obligations relating to reducing emissions of greenhouse gases. On the other hand, the Republic of Serbia became part of the mechanism of "clean" development, and should use the acquired position by supporting projects to improve energy efficiency in order to increase the competitiveness of the domestic economy.

In accordance with Article 20 of the Agreement on Energy Community of South East Europe, the Republic of Serbia has undertaken the obligation to establish a set of objectives related to the use of renewable energy sources. Therefore, the Strategy of energy development of the Republic of Serbia by 2015 predicts that the share of new renewable energy sources in total energy consumption should increase from zero to 1.1% in 2015, while the share in total final energy consumption should increase by 1.5 to 2% by the end of 2015.

The compliance with commitments is in favor of the Republic of Serbia when it comes to increasing its energy independence, i.e. security of energy supply in the future. The potential of RES in the Republic of Serbia can satisfy 25% of annual needs of the economy and population [14, pp. 45-55]. Turning to the RES, significant steps to save energy in all sectors can be made. Thus, in order to ensure energy security and economic competitiveness, to reduce negative environmental impacts from energy production and use, and to contribute to global efforts to reduce greenhouse effects, the Republic of Serbia

must make significant efforts towards the promotion and utilization of renewable energy and increase energy efficiency in all energy sectors.

1. The Potential of Renewable Energy Sources in the Republic of Serbia

Since the Republic of Serbia has high-quality of RES (Figure 1), it clearly states that it should be one of the main pillars of the energy sector in the future. Research on the effectiveness of RES usage is very small and poorly accessible to the public. For this reason, there is often confusion about RES potentials. There is a big difference between physical and economic evaluation of the potentials. For the purposes of this paper, the official estimates of economic potential are important, but because of their scarcity we often rely on estimates of physical potential. "For example, estimates are that the potential of wind energy is 10,000 MW. However, in the Republic of Serbia, in this domain, we do not have an adequate atlas of wind speeds at a height of 30-40 meters, so such estimates should be viewed with caution. Statistical data on participation of RES in electricity production are not yet complete, but by signing the Agreement of the Energy Community, the Republic of Serbia will have to improve its record on RES" [1, p. 39].

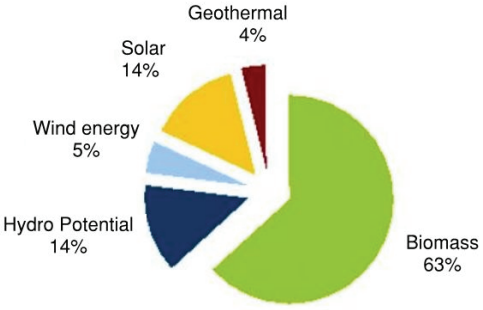

Fig. 1. The structure of RES in the Republic of Serbia [8]

The Republic of Serbia has RES whose total potential is (technically) 160 PJ (peta joules) per year. The following Table 1 presents the individual share of RES in the total potential of renewable energy [3].

Table 1. Individual share of renewable energy sources in the total potential of renewable sources, 2010 [9, p. 13]

Energy source	Annual potential	Corresponding energy savings (PJ)
Biomass	100.4 PJ	100.4
Hydro energy, with 856 hydroelectric power plants <10MW	5,200 GWh per year 1,800 GWh per year	16.7
Geothermal energy	8.3 PJ	8.3
Wind energy (require additional testing)	7.9 PJ	7.9
Solar energy	26.7 PJ	26.7
Total	160 PJ	160.0

Labels: PJ and TJ are the units of measurement for heat energy. One PJ is 10^{15}J, while one TJ is 10^{12}J.

Technically exploitable hydropower potential of the Republic of Serbia based on the size of hydropower plants can be divided into three categories:

- **Large hydropower plants**. This includes the hydroelectric power plant on the Danube and the Sava, based on the assumption that these rivers will be entirely channeled, not only because of the use of hydropower potential, but also for other purposes. Locations of water cascades are on the Danube (Begeč, power of 130 MW) and Sava (Obrež, power of 70 MW).
- **Small hydropower plants** (**0.1 - 15 MW**). This includes hydropower plants that would be built on the existing water cascades at the Danube-Tisa-Danube hydro system. The main characteristic of this category is that the use of hydropower potential is a secondary function of the system, while the primary functions are regional water supply, water protection, navigation, and the other. The Republic of Serbia has 13 potential small hydro power plants: five of them in Bačka area of hydro system Danube-Tisa-Danube Canal, seven in Banat and one on the Tisa River, at the Novi Bečej dam, also, within the Danube-Tisa-Danube Canal. The cumulative installed power capacity of small hydropower plants in the Danube-Tisa-Danube system is 25.5 MW and a potential annual production of small plants is about 95 GW.
- **Micro hydropower plants (<100 KW).** The title itself indicates a very small capacity of these plants. These are hydropower plants that would be built on the river rapids in mountainous parts of the Republic of Serbia, or in the river reservoirs. Some of these reservoirs were built with the primary task of flood protection and water supply.

In the Republic of Serbia there are currently 60 small hydropower plants (only half in operation) and there are about 856 potential locations for construction of small hydropower plants whose total capacity would be 500 MW. Based on the announcement of the P. E. Electric Power Industry of Serbia, a joint venture of the company and the "Seci Energy", company from Italy, will be producing electricity from renewable sources in power plants that will be built soon. Italian partners will buy electricity at a very high price of € 155/MW.

Permits for hydropower plants construction are issued to the "Logfor Company" for the "Cells" as well as to the "MBC Energy Company". Construction of the "Cells" in the Rasina River, downstream of Brus, with installed capacity of 4.9 MW with an annual production of 12.9 million kilowatt-hours, is a good example of cost-effective investment in renewable energy. With the price of six euro cents (€c/kWh), according to the analysis made for the "Cells", which means an increase in current price for one euro cent, or providing subsidies, the total investment of 3.2 million € will be paid off in six years, and an estimated profit within 30 years is 11.7 million €. The construction of this plant is indeed a bit cheaper than usual, because there is already a built dam and reservoir, and there are no expenditures for the payment of concession to the state. The Ibar River also has the potential for small hydropower plants. In cooperation with investors from Italy by the end of 2020, the plan is to build 10 small hydropower plants on the Ibar River. Implementation of the project initially envisaged the construction of two hydropower plants (up to 10 MW), and then the other eight starting in 2012.

Wind turbines use the kinetic energy of wind, which is converted into mechanical and further, through electric generators, into electrical energy. The production price of electricity from wind generators is already at 6 €c/KW, with the service life of 20 years. Operating costs of wind turbines are small and participate in the overall price of produced energy with only 10%.

"The wind resource analysis using parameters that are applied in the European wind atlas. Serbia is located in an area with very low potential of about 500 hours per year,

which reduces the economic attractiveness of investment" [1]. From wind energy, the Republic of Serbia has the potential to annually produce 2.3 billion kilowatt-hours of electricity that could earn about 120 million €, if sold at a price of 5 €c. In order for the electricity production by wind generators to be cost-effective, a minimum annual average wind speed of five meters per second at a height of 50 meters above the ground is necessary. Here, famous locations with the highest average annual wind speed are: Midžor (7.66 m/s), Suva Planina (6.46 m/s), Vršački Breg and Tupižnica (6.27 m/s), Krepoljani (6.18 m/s) and Deli Jovan (6.13 m/s). Currently, the locations in the Republic of Serbia where wind generators might be built are: Dolovo near Pančevo and Inđija which would have 20 MW of power each, as well as Bela Crkva and Kovin with 100 MW of power each, but these locations are still being analyzed.

Official data indicates that the price of electric energy produced by wind generators is still much higher than the price of non-renewable sources. The average price of installed KW power of wind turbines is around 800-1,200 €, depending on the size of the wind generator and pre-investment work for equipping infrastructure. The price of electricity will soon become competitive to individual conventional energy sources of low installed power. This trend will continue in the near future, especially because the Republic of Serbia expects rapid growth in electricity prices by at least 5 €c/KW or more. The cost-effectiveness analysis of wind generators in our country has not been done.

Possibility of application of **photovoltaic systems** is very broad and provides an opportunity for great savings. The average annual irradiation per square meter in the Republic of Serbia is above average in Europe (1,000 KWh) and is 1,500 KWh. In current conditions, the use of photovoltaic systems is possible for power supply of: isolated buildings (cottages, farms, camping houses, holiday villages, etc.), telecommunication systems (transmitters, repeaters, base stations, radio and TV, fixed and mobile telephone), street lighting, portable traffic signals, water pumps, systems for automated data collection and monitoring, and more. "It is estimated that it would save 1,500 GWh if the 300,000 households opted for the installation of solar collectors on the area of $5m^2$" [1]. This approach to savings corresponds to production capacity of 400 MW to the existing houses only. In comparison to the partial installation of solar collectors, investing in solar houses is a much more serious investment. Although high, this investment would pay off very quickly, in just 2-3 years, given that the average time of investment pay-back in our country is 7 years. Solar houses can easily achieve savings of 50% per household, when it comes to space and/or water heating. For space heating, in contrast to water heating, adequate thermal insulation and building construction is necessary, while making drafts, projects and plans by the local and professional architecture is not a problem.

From 2008 to 2012, 127 permits and 57 licenses were issued for the exploitation of renewable energy sources. So far, less than seven percent of the approved projects have been completed. If all 127 permits and 57 licenses had been realized, the Republic of Serbia would be providing 235 MW of energy and would not be imported electricity this year. [22]

Until recently, individual photovoltaic systems in the Republic of Serbia were mostly used in household for heating in order to reduce the electricity bills. However, since the procedure for obtaining permits was simplified, individuals recognized in such systems the opportunity for making money, so they started to build the first private solar power plants, mostly in the southern regions of the Republic of Serbia (near Blace, Niš, and Kuršumlija).

This year, the first solar power plant with capacity of 250 KW started to work in Leskovac, built by the company "DOMIT" from Lebane, and recently signed a contract to

build new solar power plant in Bojnik with capacity of 650 KW [According to 24]. In this context one more contract is also important. The Government of the Republic of Serbia and the *Luxemburg-based Securum Equity Partners Europe* signed a memorandum of understanding on 8th May 2012 with the aim of building the world's largest solar power plant. The choice of the Republic of Serbia was based on the fact that the country receives around 40 percent more solar radiation than other countries in Southeastern and Central Europe. This project will create a 3,000 hectares farm, roughly the size of 1,860 football fields. The exact location has yet to be disclosed, but initial reports indicate the Pirot district in southeast part of Republic of Serbia, along the Bulgarian border, as a likely location. Construction is slated to last three to five years and will provide 1,000 MW power. Around 3,000 jobs will be created just in the building of the farm, and 600 jobs will be created to permanently manage the farm. While the Serbian government will lease the land for free, it will generate some 750 million € in taxation from the park. Although climate is not suitable for investors, the Serbian government will do everything to come to the realization of the project, since it alone is not able to implement it [According to 23].

How much **geothermal potential** is significant for the Republic of Serbia is shown by assessments of experts, because if the full usable potential is put into the heating function, it would save 50% of the electricity that we use today for this purpose. "The amount of heat contained in geothermal waters to a depth of 3,000 meters is higher than the amount of heat that might be obtained by burning of fossil fuels at all sites in the Republic of Serbia. The Republic of Serbia has rich geothermal resources in area of Mačva and two spas - Vranjska Banja and Josanicka Banja, as well as at the site that is still not well explored in area of the Kosovsko Pomoravlje, near Klokot Banja. Geothermal thermal flow density is the more than 100 mW/m^2 in the central part of Southern Serbia, Central Serbia and Vojvodina. This parameter in Europe is 60 mW/m^2 approximately. In the Republic of Serbia there are 160 surveyed or partially surveyed sources of geothermal water. Their temperature ranges from 15.8 to 96^{o}C. Statistics show that 60 sites have a temperature higher than 15^{o}C to a depth of 3,000 meters. Therefore, we can say that this resource represents a pro-engine power of the country. Some of these sources and sites (Mačva, Vranjska Banja, and Jošanička Banja) have been known for centuries, but their usage has started very late, at least for the purposes of spa tourism and production of healthy drinking water" [13, pp. 162-167]. The general opinion is that the utilization of geothermal energy is negligible in the Republic of Serbia, given the available potential. Namely, specifically in the Klokot Banja (located on the 16th kilometer of Gnjilane-Uroševac road) mineral water, which comes to the surface at 80^{o}C, is first cooled in pools of accumulation, where huge amounts of released energy are wasted. If the geothermal water before processing and preparation for bottling first passed through a heat collection system, and then to the processing and bottling system, it would achieve a solid savings in the amount of 1 million € per year. The same system could be used for heating greenhouses in agriculture. Such projects, unfortunately, remained unrealized in Vranjska Banja, Jošanička Banja and Klokot Banja, which are missing big savings in energy consumption, and paying a higher expenditure for consumption (in tourism, agriculture, industry). The current situation is just an unnecessary burden on the pocket of customers and users of tourism services of spa centers, because the energy costs are certainly included in the price of products and services.

The territory of the Republic of Serbia has significant energy potential of biomass, bearing in mind the fact that forests cover about 24,000 km^2 and agricultural land covers about 45,000 km^2. The energy potential of biomass is estimated at 115,000 TJ per year.

The rest of the agricultural biomass is 65,000 TJ and the other 50,000 TJ is potential of forest mass after forest exploitation.

The advantages of using biomass for energy purposes are multiple: replace fossil fuels and increase energy supply security, the cost of CO_2 emissions are very low, create new jobs, energy from biomass can be redistributed to other areas, production of biogas enables the recycling of nutrients from land in an economical and environmentally sound manner and so on.

Based on the generally known methods of obtaining energy from biomass, energy production from various *residues* is particularly significant for the Republic of Serbia. Briquetting possibility of different types and categories of residues are large, primarily in agriculture, forestry and timber industry, which is discussed in detail in the document the *White book - P. E. "Electric Power Industry of Serbia*". By using technology and equipment for obtaining ecological briquettes the so called Effect 3E is achieved: economic, environmental and energy. The economic effect of briquettes is reflected in the fact that the production of briquettes is highly accumulative. Invested funds are returned within 1 to 2 years, because the minimum investment for the smallest capacity is 15,000 €, and the price of standard briquettes on the market is about 70 €. Combustion of briquettes does not pollute the environment because the process is clean and complete with 1-7% ash, so the environmental effect is obvious. The energy effect consists in the fact that on invested 1 KWh receives 5 KWh of energy, while the calorific value is approximately equal to brown coal (16-18 MJ/kg).

It is estimated that the total number of cattle in the Republic of Serbia is about 583,000, with the highest number in Vojvodina [5]. On this basis it is estimated that the theoretical annual potential of biogas production in the Republic of Serbia is about 1,280 gigawatts per year (GW/year), and 4,600 TJ/year (about 200 million m^3 of biogas). Only a smaller part of the cattle is on the large farms, but the large farms are only interesting for the production of biogas, because they can produce a sufficient amount of liquid manure from which it is possible to obtain a sufficient amount of biogas to produce electricity and/or heat. Price of biogas plants is relatively high and smaller farms have little interest for their construction, and the collection and transportation of liquid manure is currently not practiced in our country, but it is practiced in Austria, Germany and USA. "On the farm, 100 to 120 cattle can provide the amount of fertilizer that can produce 400 KWh per day of electrical energy, whereby the required investment in the construction of these plants would be about 60,000 €, with repayment period of 4 years, which is considered economically very profitable investment" [15, pp. 72-81].

2. Efforts to Achieve More Efficient Use of Renewable Energy in the Republic of Serbia

Based on the above mentioned, it can be said that the Republic of Serbia has significant potential for renewable energy. In the Republic of Serbia there is a special advantage and demand for new organized use of RES in the form of *decentralized thermal energy* (biomass, solar energy) and *electrical energy* (mini hydropower plants up to 10 MW and wind farms up to 1 MW) to cover the needs of consumers at the local level, as well as the delivery of surplus electricity to local networks, within the electric power system. Also, there are potential resources in the Republic of Serbia that local authorities have not fully

identified, particularly in less developed areas [7]. As there is no sufficient information about investment opportunities, investors, especially foreign ones, are forced to assess opportunities for potential investments individually, or hiring specialized agencies.

The Energy Development Strategy of the Republic of Serbia until 2015 regulates the Program of selective use of new renewable energy, which constitutes the legal framework for the implementation of all activities towards the efficient use of RES. This strategy defines five priorities, of which two are related to this issue [8]:

- Selective use of new renewable energy sources (biomass, geothermal and solar energy, wind energy and the remaining technically exploitable and economically acceptable hydropower potential, especially on small rivers);
- Rational use and increase in energy efficiency.

Estimates of potential savings that would be achieved by realizing the set goals show the importance of the Energy Development Strategy of the Republic of Serbia. According to the data and estimates of the Energy Efficiency Agency of the Republic of Serbia, by efficient heating and improving energy efficiency in the industry, energy consumption in the Republic of Serbia could be reduced by more than 50%. Due to low efficiency, there is a high level of consumption at converting electrical energy (15%) as well as 15% loss due to poor conditions in the electrical distribution network [16, pp. 27-32].

The attractiveness of the type of energy generated from the RES is not the same at all locations, so the production of energy from the RES is a question of optimization at the local level. Taking into account the benefits of renewable energy that have been previously mentioned, it is necessary to establish adequate network and strong cooperation of local authorities. Moreover, in order to achieve positive results in increasing the production of energy from the RES and reducing electricity consumption, raising the awareness about the benefits of renewable energy is a necessary step. A big help from the country would be expected. The European Union absolutely supports this approach. For example, based on the EU law, all consumers have to install the so-called "smart meters" by 2020. There are a lot of incentives and some of them are: lower taxes and registration taxes on environmentally friendly cars, the introduction of environmentally friendly cars to public transport, easier and cheaper obtaining of building permits for environmentally friendly facilities, subsidies for the purchase of ecological cars and building materials used in environmentally friendly objects, lower taxes and fees for legal entities that comply with environmental standards and so on [1].

Since the Republic of Serbia does not have different types of renewable energy comparing to the countries in the region, it appears that the mechanisms for promotion should be typical for the environment (as in Hungary, for example). "Feed in" tariffs are important for the investors and financial institutions because they reduce risk and bureaucratic costs. The World Bank recommends that a mechanism of support in the Republic of Serbia include the hidden costs of environmental violations that exist in plants using fossil fuels. Therefore, the government of the Republic of Serbia in 2009 passed a *Decree on incentives for the production of electricity from RES and combined production of electrical and thermal energy*. This Decree ("Official Gazette of RS", No. 99/2009) encourages the incentives for production of electricity from RES and for purchase of such energy, so-called "feed in" tariff, balancing and meter reading, defines energy facilities that produce the electricity from RES, regulating the content of the contract for the purchase of electricity based on the incentive measures, as well as the compensation costs to the buyer of

such produced energy [19]. Incentive measures include the purchase price specified in this Decree based on the type of plant that produces electricity using renewable energy and the installed power (P) expressed in MW. Type of plant and installed power are defined by the *Act of acquiring the status of privileged producer of electrical energy*. The purchase prices are in euro cents (€c/1 KWh), and depending on the type of RES and type of plant they vary in the following ranges: from 5.9 to 10.38 for hydropower plants, from 11.4 to 13.8 for biomass, from 12-16 from biogas, 9.4 for the solar energy plants, 23 for geothermal energy plants, 7.5 for plants with combined production on fossil fuels [19].

Decree on incentives for production of electrical energy by using RES and combined production of electrical and thermal energy, also highlights the comparative advantage of biomass (Figure 1) in comparison to other forms of potential RES. The Republic of Serbia, by direct incentive measure strives to achieve a goal of substituting intensive energy import regime by own production of energy from RES (Table 2), through increasing the purchase price of energy produced in plants which as fuel use biomass and biogas in relation to the purchase price of energy generated from other renewable sources (excluding energy generated from solar energy plants) [9, p. 13].

Table 2. Incentives in the Republic of Serbia in order to determine the purchase price of energy [19]

No.	Type of plant	Installed capacity (MW)	Incentive measures - purchase price (€c/KWh)
1.	Hydropower plants		
1.1		Up to 0.5 MW	9,7
1.2		From 0.5 MW to 2MW	10,316-1,233*P
1.3		From 2 MW to 10 MW	7,85
1.4	On the existing infrastructure	Up to 2 MW	7,35
1.5	On the existing infrastructure	From 2 MW to 10 MW	5,9
2	Power plants using biomass		
		Up to 0.5 MW	13,6
		From 0.5 MW to 5 MW	13,485-0,489*P
		From 5 MW to 10 MW	11,4
3.	Power plants using biogas		
		Up to 0.2 MW	16,0
		From 0.2 MW to 2 MW	16,444-2,222*P
		Over 2 MW	12,0
4.	Power plants using landfill gas and gas from plant for municipal wastewater treatment		6,7
5.	Power plants using wind		9,5
6.	Power plants using solar energy		23
7.	Power plants using geothermal energy		7,5

Remark: In Table 2 in the last column - P represents the installed power expressed in MW.

Table 2 shows incentives in the Republic of Serbia in order to determine the purchase prices of energy based on type of plant that produces electricity by using RES and the installed power (P) expressed in MW. Given the potential reserves and the guaranteed

purchase price, which is in the third column, it is reasonable to expect that the production of energy by power plants that use biomass as fuel will be developing in future.

CONCLUSION

The growth of electricity prices in future will certainly encourage individuals and legal entities to use the energy from the RES, such as heating using solar energy or energy derived from biomass. For this reason, it is necessary to do everything to create the conditions for market transparency. The legal framework for energy production from renewable energy sources, coupled with incentives, should be directed towards achieving economic, environmental and energy benefits, to point to the possibility of further investments in plant construction and to motivate domestic and foreign investors to realize the projects related to this area. According to the Energy Law of the Republic of Serbia [20] the responsibility for adopting regulations and strategies of energy development is divided. Also, these laws concern the reorganization of public energy companies, the abolition of monopolies in the energy sector and pay special attention to renewable energy sources, which is set up a legal framework for market transparency. Additional acts of law enforcement from 2011, although in plan, have not yet been adopted. Therefore, in order to ensure market transparency, it is necessary to simplify the bureaucracy, provide economic and political stability and the implementation of adopted laws, adopt additional regulations and create conditions for establishment and operation of small and medium-sized energy companies to deal with production and trade of energy.

Particular attention should be paid to the simplicity in obtaining permits (for example, permits as a privileged producer) and various approvals. Examples of successful steps and mistakes made in the EU member states and neighboring countries can be of great importance to us. Therefore, in addition to effective work on incentive measures in all areas (legal framework, investments, raising awareness of consumers, etc.), in order to promote the use of renewable energy, it is necessary to perform the analysis and discussion of the experiences of other countries, in order to take the right steps. In any case, the pursuit of the Republic of Serbia for the increased use of renewable energy is in accordance with the practice of developed countries in the EU and is aimed at reducing greenhouse gas emissions, importing dependency and encouraging sustainable development. Therefore, it is necessary to anticipate and plan implementation and take measures to eliminate all barriers that limit the investments in this area.

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PERSPEKTIVE KORIŠĆENJA OBNOVLJIVIH IZVORA ENERGIJE U SRBIJI

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Energetske krize, smanjenje zaliha fosilnih goriva i enormno zagađenje planete uticali su da se mnoge zemlje okrenu alternativnim izvorima energije, pre svega obnovljivim. Radi obezbeđivanja energetske sigurnosti i ekonomske konkurentnosti, kao i smanjenja negativnog uticaja na okolinu, Srbija mora da uloži značajne napore ka promociji i iskorišćenju obnovljivih izvora energije i povećanju energetske efikasnosti u svim energetskim sektorima.

Ovaj rad nastoji da ukaže na prednosti korišćenja obnovljivih izvora energije, kako bi se podigla svest o značaju dobijanja energije iz ovih izvora energije. Na taj način će se poboljšati kvalitet životne sredine i smanjiti zavisnost od uvoza energije. U ovom radu daće se pregled stanja i potencijala obnovljivih izvora energije, kratak opis određenih podsticajnih mera uz osvrt na međunarodne konvencije, ugovore i uslove pristupanja Srbije Evropskoj uniji vezanih za korišćenje obnovljivih izvora energije.

Ključne reči: obnovljivi izvori, energetska bezbednost, energetska efikasnost, zavisnost od uvoza fosilnih goriva, podsticajne mere, Srbija, Evropska unija.