

Renewable Sources in Function of Sustainable Development of Republic of Serbia

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Abstract

Modern economical, technological and social development challenge science with various questions that seek their answers in some solutions that should guide the human kind towards its further existence. Driven by these ideas people are finding solutions to many issues. One of these issues is certainly the matter of draining dry the highly exploited sources of energy. The use of alternate and renewable sources of energy thus becomes obviously necessary and popular.

Sustainable and alternative sources of energy, some of which are new on the scene while the others and being used for a long time now, include photo tension systems, heat collectors, wind potential, hydro potential, biomass, geothermal potential, fuel cells, etc. Some of these sources that enable profitable use of electrical and thermo energy are still in the process of development so their commercial use is yet to come. As the demand for energy is ever rising, along with it grows the dependence of importing it.

Key words: Renewable energy sources, sustainable development, bio-balance

1. Introduction

The development of industrial revolution was highly shaped by the ability of energy to follow through the practical use of scientific enhancements and discoveries. Flexible shapes of energy, and especially electric energy, have stimulated and implemented some technological solutions, thus creating a significant growth of world economics.

Ecological environment was paying the price of production and use of energy, and this price was very high. Up until the late fifties, the care for environmental issues, especially in the developed countries, has manifested through laws and regulations designed to manage and control waste disposal and other forms of pollution. Developing countries, although sharing

common worries weren't able to redirect some of their economic means from the development and economic growth sector towards environment protection.

The oil embargo for OPEC countries in the seventies has definitely caught political eye of the public about how oil is generally a very limited resource. However, the lowering of energy prices in the seventies, followed up by the dynamic rising of flexible offer of energy in the world, has brought up serious questions about the insupportable connection between energetic systems and eco-environment. As a consequence of the above mentioned is a clear need to start some new technological process of production, distribution, and use of alternative sources of energy.

2. Usage of renewable sources of energy

a. Generally

Modern science and present practice show that use of the traditional sources of energy in all areas of human life is already facing problems of draining these sources out. Therefore, the purpose of this study is to justify the use of energy derived from Sun, wind, geothermal energy, biomass energy and others, as these represent a likely near future for agricultural production.

b. The use of solar energy

Solar energy is more than enough to satisfy all the bigger needs of the world. During one year, Sun sends us about 10,000 more than the amount of energy needed to meet the consumption of our entire population. About 37% of world energy demand is satisfied through electric energy (close to 16,000 TWh in 2001.). If this energy was generated through photo-tension systems of modest yearly output power of 100 kWh per square meter, it would need the area of 150 x 150 km² to accumulate the Sun's energy. A large portion of this area could be placed onto the roofs and walls of the buildings, so it wouldn't have to take up much ground space. Solar energy is interesting for its availability and its clean pureness.

c. The use of wind energy

The oldest windmills were in Persia (today's Iran) in the VII century e.g. A small portion of this natural potential is being used for production of electric energy, but due to mastering some of the specific technologies and lowering the prices of installation it does have a positive growth trend. In California, there are the biggest clusters of modern windmills called *wind farms*. This kind of a system produces around what an average nuclear power plant produces (1200MW), while the installation expenses are about the same. The lack of negative effects for the environment is the main argument for using the power of wind. The use of this kind of system is obviously not possible just anywhere in the world because it requires a certain number of windy days in a year, but along with some other alternative sources of energy it makes up a powerful weapon in fighting emission of harmful gases on the global level. Energetic crisis, shortage in supply of fossil fuels, and serious pollution of the planet have caused the industry of wind-generators, to develop over the past 30 years almost as fast as the IT sector, making it a very stable and perspective industry today. According to many experts, we can expect further growth of installed capacities in the future; trends of constant lowering of prices for wind-generators installation and worsening condition of environment

speak in their favor. By the end of 2001 the world had 56,000 of wind-generators accumulation the total power of 25 GW. Last year's growth in capacities was 52 percent. German market still has the highest share, followed by USA, and Spain. Eastern Serbia's areas such as Stara Planina, Vlasina, Ozren, Rtanj, Deli Jovan, Crni Vrh are potentially areas where installing wind-generators would be economically justified. In these regions there are locations that have average wind speed of 6 m/s. This area stretches over 200 km², and could potentially hold up to 2000 MW of installed power of wind-generators. Zlatibor, Žabljak, Bjelasica, Kopaonik, and Divčibare are mountain areas that could be micro-locations for wind-generators. Panonska nizija (west of Danube, and all the way to the Hungarian border), is also a very windy area. This area covers over 2000 km² and is great for installation of wind-generators because of its developed infrastructure. In perspective, this area could have installed between 1500 and 2000 MW of wind-generating production capacities.

d. The use of energy from waters (hydro-potential)

The total hydro-potential of Serbia is estimated to about 31,000 GHz a year. Most of that potential (around 62%) is already used because building larger production capacities is economically justifiable. Building smaller and more expensive objects, especially if we consider mini-power plants could use the rest of hydro-potential. Some estimation of smaller hydro-powered plants, including both micro and mini power plants, at over 1,000 possible locations with installed unit power of under 10 MW, show that the small water flows can have the total installed power of around 500MW and a total yearly production of 2,400GWh. Half of that can be located in the Užice, Niš and Kragujevac region, where 700 smaller locations can have a cumulative capacity of 340MW each. Since most of our unused hydro-potential in within reach of smaller hydro-powered plants, this part has been given extra attention. A cadastre of smaller hydro-powered plants of under 10MW of power has also been done. The results are shown as a total installed power of 453 MW I an average production of 1,600 GHz/year at 868 locations. At present, only 31 mini hydro-powered plants are operating, at total power of 34,654 MW and yearly production of 150 GHz. Not operating are 38 mini plants of total power 8,667 MW and estimated yearly production of 37 GHz. These 38 plants cannot be put in order without investing appropriate funds in them. There are significant opportunities for installing smaller hydro-powered power plants into already existing hydro-industry orientated facilities, which are also characterized by much lower expenses attached to them.

e. The use of geothermal energy

Geothermal energy is all around us. At some places it is easy to access, somewhere it even surfaces on its own in the shape of hot water and steam, but there also are places where it is inaccessible, like at high dept and so. Research shows that Serbia has high potential for use of geothermal energy and that in the future it should take a serious stake in energy plans. Some results show that with careful development of geothermal resources, before 2015 we could substitute at least 500,000 tons of liquid fuels a year. At most areas, the thickness of geothermal heat flow is larger than its average value for continental Europe, which is around 60 mW/m². The largest values, over 100 mW/m², are recorded in the Panonski basen, which counts 160 natural springs of thermal water with temperature higher than 15 degrees Celsius. Those highest temperatures of them have waters of Vranjska Banja (96°C), Jošanička Banja (78°C), and Sijerinska Banja (72°C). The total cumulative flow is around 4,000 l/s. By current data, Serbia has 60 springs with water temperature of over 15°C down to the depth of 3000m. The cumulative amount of heat accumulated in the depths not larger than 3 km is about twice as much heat that can be deprived from burning of all the kinds of coil in Serbia. The flow

capacity of geothermal resources in Vojvodina is around 550 l/s, while the heat power is around 50 MW. The rest of Serbia 48 wells can produce 48 MW. Other than good preconditions for exploiting heat energy and other geothermal resources for geothermal waters, Serbia also has good preconditions for depriving heat energy from certain kind of “dry” rocks - a kind that is not getting in contact with underwater. In this case, water is usually being pumped into the underground warm rocks where it heats up, and as it gets out an energy transfer occurs.

f. The use of energy from biomass

Biomass is an organic substance of animal or herbal origin that is being put through different processes to give usable energy. Energy of floral origin represents, during its photosynthesis, an accumulated light energy, which had the light transform into chemical energy. During the photosynthesis, the plants are using carbon dioxide from air and water in order to create carbon hydrates that actually make up the basic structural elements of biomass. This way, light energy is being accumulated in chemical relations of structural components of biomass. This kind of energy can be exploited in many different ways. On the other hand, the basic component of biomass derived from animals is the natural liquid manure. The use of biomass is a process of its heating up and unleashing heat that moves generators of electric energy. Energy accumulated in biomass is of chemical nature, so it flows without stops and is much more constant than solar or wind energy. From this perspective, biomass has many more characteristics of fossil fuel as a renewable resource, which is understandable because fossil fuels are actually a form of biomass. From a historical point of view, biomass was the only source of energy for the human kind, mostly in the shape of wood used as a source of fire, which that shifted to fossil fuels during the ages of industrialization. Even with this being said, biomass today encounters for 15 percent of total consumption of energy, and it is also important to notice that this is more underlined in the developing countries. One of the most important factors that determine the potential role of biomass in energetic industry is a strong competition between the value of biomass and the grounds necessary for its growing, which is not the case with the rest of renewable resources. Biomass can be used as food, fertilizer, for production of paper fabric, and as fuel.

Serbia's first bio diesel production facility has started working in 2007. However, the use of bio diesel is still not widely accepted. This problem has been actively worked on, because forecasts say that this fuel will be widely used in commercial transport in the future.

On the macro-economical side of view, the production of horticultures needed for production of bio diesel, and then the production of bio diesel itself, has a positive effect on raising involvedness of all factors of production (land, work, and capital), thus having a multiplier effect on investments and GDP. It is not to overlook the moment of extra inflow toward the agriculture sector (subventions for growers, gifts, beneficial crediting), and a sped up process of regional and rural development which, in theory, should result in better funds channels; raising foreign currency reserves consequentially leads to loosening the dependence belt of macro economical aggregates of outside factors.

3. The results of the research

Production has always requiring large amounts of energy. The very fact that the supplies of necessary fossil fuels are very drainable, says much about the importance of having a serious approach towards supplying this strategically important product. This is the main reason why many approaches have been focused towards successfully using alternative fuels. Just in the

next decade or two, most of fossil fuel supplies are going to run out, and so most countries will be forced to turn to alternative sources of energy for satisfying their energetic needs. The use of alternative sources of energy can be a good opportunity for employment, which might help, solves some issues on national levels, but also enhance international connections. In this light, it is important to underline the potential of solar energy, which is available in larger quantities than human kind will ever need. It is important to realize that the main obstacle to using this source to its max is the present under-developed infrastructure and the steps we will need to take to support the production from this source. It goes for the use of wind energy; it also requires certain infrastructure, which is not on the desired level today.

For now, Serbia is using biomass as a source of energy for which it already has built up facilities. In use are 31 mini hydro-powered plants, while potential for using new ones is large due to Serbia's wealth in waters.

4. Conclusion

With the goal of preserving biological balance, it is necessary to rationally use natural resources with the best interest of present and future generations. The intense use of traditional sources of energy has a harmful effect on the biosphere. They are apparently drainable, which is a realistic threat to sustainable development. The only solution to this issue is the use of alternative sources of fuel. This would have positive effects on employment and overall GDP. For quite some time now, the experts have been pointing out to the general public that the optimal strategy of sustainable development is in the use of alternative sources of energy. Republic of Serbia is very rich in alternative sources of energy, but it lacks infrastructure for its production and use. The only way for using alternative sources of energy in Serbia, in respect to sustainable development, is with the help of governmental institutional support, technological creativity, and good connections between all the participants—from the producers to the end-users.

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