

Pursuant to Article 6, Paragraph 1 of the Energy Law (“Official Gazette of RS”, no. 84/04), and Article 42, Paragraph 1 of the Law on Government (“Official Gazette of RS” No. 55/09, 71/09 correction, 101/07 and 05/08),

The Government adopts

DECREE

ON AMENDMENTS AND SUPPLEMENTS TO THE DECREE ON PROGRAM FOR THE REALIZATION OF THE ENERGY SECTOR DEVELOPMENT STRATEGY OF THE REPUBLIC OF SERBIA UNTIL 2015 FOR THE PERIOD 2007 -2012

Article 1

The Decree on Program for the Realization of the Energy Sector Development Strategy of the Republic of Serbia until 2015, for the period 2007 – 2012 (“Official Gazette RS”, no. 17/07 and 73/07), the Program for the Realization of the Energy Sector Development Strategy of the Republic of Serbia by 2015, for the period 2007 – 2012 , Section 13. RENEWABLE ENERGY SOURCES is being amended and reads as follows:

“13. RENEWABLE ENERGY SOURCES

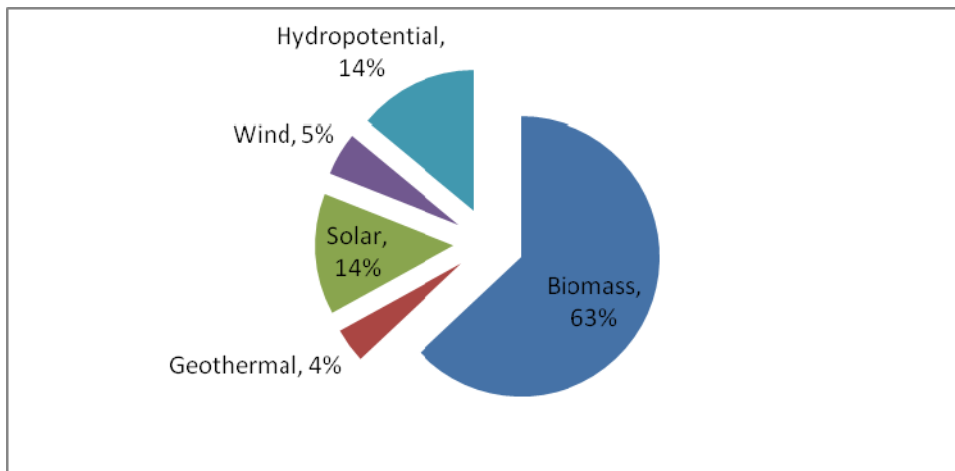
13.1. Definition of Renewable Energy Sources

Under the term Renewable Energy Sources (RES), in Article 3, Item 14 of the Energy Law, lists those energy sources which are found in nature and are completely or partially renewable, in particular hydro-energy, wind energy, un-accumulated solar energy, biomass, geothermal energy and other sources. This chapter of the Program will concentrate on the implementation of the above-mentioned Renewable Energy Sources.

The consumption of these energy sources contributes to more efficient usage of domestic energy production potential, the reduction of “greenhouse gasses”, the decrease in the import of fossil fuels, the development of local industries and creating new jobs.

13.2. Energy Potential of Renewable Energy Sources in the Republic of Serbia

Technically utilizable energy potential of the above-mentioned renewable energy sources in the Republic of Serbia is very significant and estimated at over 4.3 million tons of oil equivalent (from henceforth “*toe*”) per annum – of which 2.7 million *toe* per annum lies in the production of biomass, 0.6 million *toe* per annum in the unused potential of hydro-energy, 0.2 million *toe* per annum in already existing geothermal sources, 0.2 million *toe* in wind power and 0.6 million *toe* per annum in solar energy. The individual participation of renewable energy sources in the overall potential is as follows:



Hydro-energy and biomass energy are the renewable energy sources with the most significant energy potential, and as such are particularly emphasized in the Strategy within the priority of selective consumption of renewable energy sources.

13.2.1 Biomass

The overall biomass energy potential in the Republic of Serbia is estimated at 2.7 million *toe*. It is composed of wood waste and forestry remains (cca. one million *toe*), and remains in cattle farming, fruit farming, vineyard remains and primary fruit processing (cca. 1.7 million *toe*). The biomass energy potential in cattle farming, which is suitable for biogas production is estimated at 42.000 *toe*.

13.2.1.1 Biogas

The available quantities of liquid animal waste on mid-sized and large fowl and cattle farms allow the production of 42.200 *toe* of biogas energy. This quantity of liquid animal waste with the appropriate amount of added agriculture biomass remains allows the installed energy of the biogas power station to reach up to 80 MW.

The production of biogas from liquid animal waste has energy significance, but also an ecological one as well. As a result of anaerobic digestion, apart from biogas we get liquid remains that are used a fertilizer. As a result of great defragmentation of agricultural farmland in the Republic of Serbia, it is advisable to collect and handle the animal from different farms in one facility.

13.2.1.2 Biofuels

The Republic of Serbia meets the standards for biofuel (bioethanol and biodiesel) production.

Bioethanol: The production of ethanol in the Republic of Serbia today is derived from molasses (cca. 50%) and crops (cca. 50%). The available amount of molasses does not meet the demand for bioethanol production: the total capacity in already constructed sugar factories generate cca. 200.000 tons of molasses annually, of which 50.000 tons are used, whilst the remaining 150.000 tons can be used in other ways, such as the production of bioethanol. The needed amounts of molasses for the production of bioethanol would need to be imported, in the condition of great fluctuating prices and available amounts on the world market.

As a result of developed crop farming and the fact that the produced amounts of crops fully meet and exceed domestic demand for human and animal consumption, it is necessary to consider the possibility of bioethanol production from crops.

To produce 100.000 tons of bioethanol, 330.000 tons of crops are needed, which represents one third of the market crop surplus or a total of 2-4 % of total crop production.

Other alternative raw materials suitable for the production of bioethanol, for which there is potential and can be found in our country include sorghum, Jerusalem artichoke (topinambur) and potatoes. According to estimates, there is around 100.000 ha of marginal land that can be used for the harvesting of sorghum and Jerusalem artichoke, which would be used to produce around three million tons of bioethanol annually.

Biodiesel: Raw materials such as oilseed (made from sunflowers, soya beans and turnips) and edible oil waste are suitable for the production of biodiesel in the Republic of Serbia.

The total surface under oilseed crops is estimated at 668.800 ha, of which the growing of oilseed crops used for the production of biodiesel could be achieved on a surface of 350.000 ha. Average production of biodiesel from oilseed crops which can be grown in the Republic of Serbia are shown in Table 13.1.

Table 13.1: Production of biodiesel from oilseed

Oilseed	Average grain yield (t/ha)	Oil content per grain (%)	Biodiesel production	
			(kg/ha)	(l/ha)
Sunflower	1.79	40	716	816
Soya	2.25	18	405	460
Turnip	1.69	36	608	690

Depending on the type of oilseed crop being farmed, potential quantities of produced biodiesel on available land (350.000 ha) are shown in Table 13.2.

Table 13.2: Potential biodiesel production

Harvest structure	Potential biodiesel production (t)
100 % turnip	212.800
70 % turnip + 30 % sunflower	224.140
50 % turnip + 50 % sunflower	231.700
30 % turnip + 70 % sunflower	239.260
100 % sunflower	250.600
100 % soya	141.750

The consumption of edible oil in the Republic of Serbia is around 16 liters per capita, which brings up the conclusion that 10.000 liters of edible oil waste could be used for the production of biodiesel in the Republic of Serbia annually (these issues are regulated by the Management of waste oil Act – “Official Gazette RS”. No. 60/08).

13.2.2 Small hydro power plants

Under the Energy Law, the term Mini Hydro-electric Power Station is defined as any hydro-electric power station with a power of up to 10 MW.

The watercourse energy potential and the locations for the construction of small hydro power plants are determined in the “Cadastre of small hydro power plants in the Socialist Republic of Serbia excluding Socialist Autonomous Provinces” document from 1987, which for the requirements of Public Enterprise “United Electric Power Industries” was drawn up by “Energoprojekt – Hidroinženjering” and the “Jaroslav Černi” Institute (from henceforth: Cadastre MHEPS), as well as a cadastre of small hydro power plants in AP Vojvodina, which lists 13 hydro-electric power stations (“Hidroinvest” DTD, 1989). It is possible to construct these power stations in other locations with the approval of the Ministry of Mining and Energy in regard to the maximum utilization of the energy potential of water sources and the authorization of other Ministries and other institutions. For existing multifunctional reservoirs, hydro-energetic parameters for the construction of small hydro power plants, which also define the maximum power station power, are specified by Public Enterprise “Srbijavode” Beograd (“Serbia Waters” - Belgrade), or for the Autonomous Province of Vojvodina, Public Enterprise “Vode Vojvodine” – Novi Sad (“Waters of Vojvodina” – Novi Sad).

Should any of the locations envisaged in the cadastre in Paragraph 2 of this subchapter, owing to changes in hydro-geological conditions, already constructed buildings or other significant changes which came about occupying and using the area, not allow the construction of a mini hydro-electric power station or the expected power would be lower than anticipated in the cadastre, the construction of the mini hydro-electric power station, with the approval of the Ministry of Mining and Energy, can be allowed in a different, or more than one location on the same watercourse, which would allow the maximum utilization of the energy potential.

Based on the results from the cadastre in Paragraph 2 of this subchapter, Table 13.3 lists the hydro-potential in selected municipalities in the Republic of Serbia.

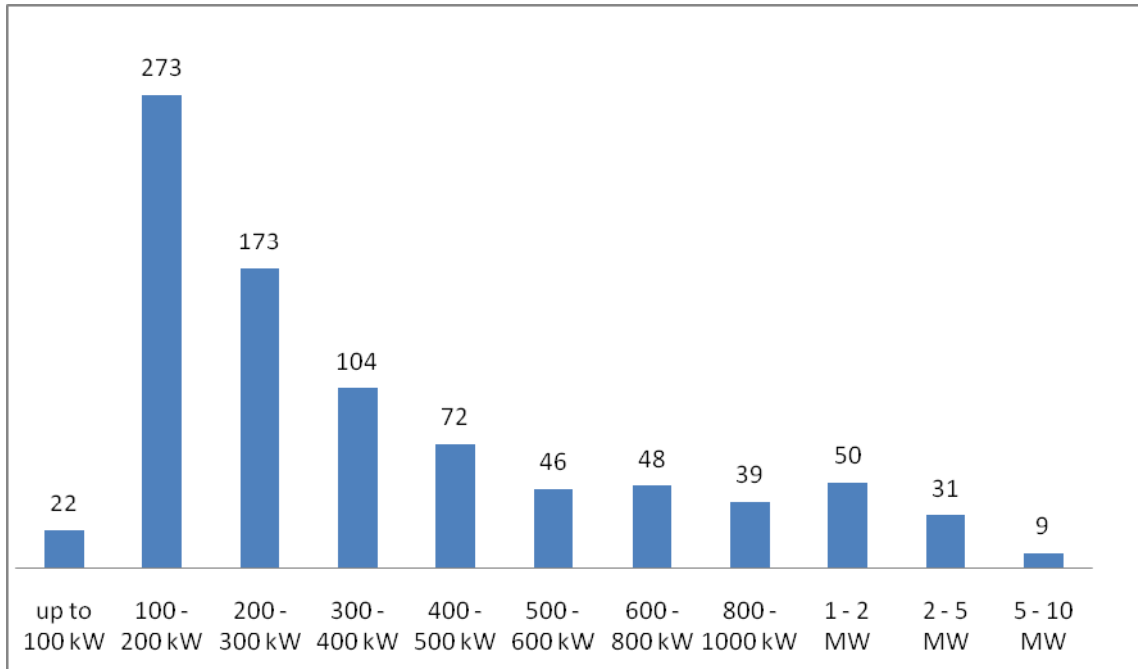
Fully utilizing the energy potential of small hydro power plants, it is possible to produce around 4.7% of the total electric energy in the Republic of Serbia (34.400 GWh per annum achieved in 2006) and around 15% of the current electric energy production produced in hydro-electric power stations (10.900 GWh per annum).

Table 13.3. Municipalities with the biggest potential for the construction of small hydro power plants (MHEPS)

Number of locations for the construction of MHEPS	Estimated Power (kW)	Potential Production (MWh)	Municipality
64	34.300	121.203	Ivanjica
35	33.284	109.692	Raška
40	25.925	94.026	Pirot
40	23.458	78.394	Kraljevo
47	18.800	73.971	Prijepolje
9	17.576	60.210	Zaječar
22	17.045	72.212	Crna Trava

20	15.825	55.100	Novi Pazar
8	15.690	58.850	Bela Palanka
8	11.216	25.850	Despotovac
30	10.974	45.391	Brus
19	10.706	30.180	Knjaževac
32	10.185	38.438	Vranje
22	10.141	38.985	Kuršumlja
16	9.875	35.318	Priboj
30	9.800	36.099	Trgovište
13	9.785	30.937	Valjevo
10	9.305	27.419	Tutin
16	8.945	24.380	Žagubica
17	8.675	34.553	Bosilegrad
19	8.625	32.877	Čajetina
17	8.320	29.720	Leskovac
21	8.310	36.832	Nova Varoš
27	8.170	32.543	Surdulica
13	7.990	28.262	Vlasotince
19	7.640	27.395	Bajina Bašta
12	7.070	27.500	Niš
8	6.740	20.050	Boljevac
12	5.346	17.928	Užice
15	5.325	19.862	Ljubovija
7	4.730	10.230	Negotin
11	4.690	16.578	Vladičin Han
6	4.655	20.283	Arilje
14	4.515	19.459	Babušnica
1	3.000	13.700	Novi Sad
1	850	4.700	Vrbas
1	620	2.270	Bečej
1	1.220	8.190	Bela Crkva

Picture 13.1 The number of small hydro power plants according to installed power



Based on the result of 15 pre-feasibility studies for the construction of small hydro power plants, it is conclusive that the construction of small hydro power plants on 5 – 10% of the total number of anticipated locations by the cadastre is realistic in the current market conditions.

In the forthcoming period it will be necessary to continue the detailed revision of locations provided in the cadastre for small hydro power plants with an installed power exceeding 600 kW, so as to produce a more precise list of suitable locations and also to create a better plan basis for the use of this renewable source.

13.2.3 Geothermal Energy

Natural and artificial sourced of thermal water have been identified in over sixty municipalities in the Republic of Serbia, based on previous research and metrology of temperature. The water temperature generally reaches 40°C, and only exceeds 60°C in six municipalities: Vranje, Šabac, Kuršumlija, Raška, Medveđa and Apatin.

The average water flow from existing sources and wells is 20 l/s. There are a few locations where the water flow exceeds 50 l/s (Bogatić, Kuršumlija, Pribojska Banja, Niška Banja), and only one location where the water flow exceeds 100 l/s (Banja Koviljača).

The total thermal power which could be produced by using all of the existing sources of thermal water equals around 216 MW_t, with a production of thermal energy of around 7650 TJ annually, which equals around 180,000 toe.

The use of existing geothermal sources should be aimed at thermal energy production for the needs of various purposes – spa tourism, heating of sanitary water or a room used for the needs of agricultural production and other such needs.

13.2.4 Wind Energy

Based on existing and procurable analyses and studies, the realistic wind energy potential in the Republic of Serbia is estimated at an installed power of 1300 MW. The energy potential estimate is based on the data collected by the Hydro-meteorological Service of Serbia by collecting measurements from meteorological poles at a height of ten meters, whereby it was concluded that the most perspective locations for the construction of wind farms include: Midžor Mountain, Suva Planina, Vršački Breg, Stara Planina, Deli Jovan, Krepoljin, Tupižnica, Juhor and Jastrebac. For the precise justification assessment for the construction of wind turbines in the given location, it is necessary to calculate the wind speed and direction.

The Agency for Energy Efficiency of the Republic of Serbia has measured the wind parameters at a height of fifty meters – in Negotin, Veliko Gradište and Titel.

Table 13.4 Results of the wind speed measurement at a height of 50 meters

Location	Average wind speed at a height of 50 m (m/s)		Extrapolated average wind speed at a height of 80 m (m/s)		Data availability	
	6 months	12 months	6 months	12 months	6 months	12 months
Veliko Gradište	3.61	3.50	3.82	3.71	99.7%	99.0%
Negotin	5.24	5.77	5.55	6.10	86.4%	92.4%
Titel	4.68	4.72	4.95	4.99	97.8%	98.1%

In the near future it is going to be necessary to continue with the wind speed measurement at a height of fifty meters with the aim of creating a wind atlas and creating the conditions for investing in capacities of electric energy production which uses wind power.

13.2.5 Solar Radiation Energy

The average intensity of solar radiation on the territory of the Republic of Serbia spans from 1.1 kWh/m²/per day in the North to 1.7 kWh/m²/per day in the South – during January, and from 5.9 to 6.6 kWh/m²/per day⁶ – during July.

On an annual level, the average value of global radiation for the Republic of Serbia equals from 1200 kWh/m²/per annum in the North-Western Serbia, to 1550 kWh/m²/per annum in South-Eastern Serbia, while in Central Serbia it reaches around 1400 kWh/m²/per annum. The degree of utilization of radiation depends on the characteristics of the installed heat receiver, so the average value of energy can be estimated at 700 kWh/m²/per annum in the Republic of Serbia.

According to the 2002 census, there are 2.5 million households in the Republic of Serbia. If on average, every fifth household installed a solar panel with a surface of 4 m², around 1750 GWh of energy per annum would be produced, which would for the major part substitute the consumption of electric energy, and partially fossil fuels which are used for heating sanitary water, and allow the reduction of CO₂ emission by 2.3 million tons per annum.

In the near future, it will be necessary to promote activities aimed at promoting the use of solar energy for heating sanitary water and rooms, and the development of solar power stations for producing electric power.

13.3 Current strategic framework for the consumption of renewable energy sources in the Republic of Serbia

The Energy Development Strategy of the Republic of Serbia by 2015, within the Priorities of selective consumption of renewable energy sources, notes that in the Republic of Serbia there are certain benefits and needs for an organized consumption of RES in a so-called decentralized production of thermal (biomass combustion and collection of solar power) and electric energy (with the construction of small hydro power plants and wind generators with a power of up to 10 MW), in order to meet the needs of local consumers, also in the delivery of any surplus electric energy to the local grid within the electric power system of Serbia.

The strategy which regulates sustainable development defines the national priorities of sustainable development, amongst which is also stimulating renewable energy consumption with the aim of protecting and advancing the environment and the rational consumption of natural resources, decreasing pollution and pressure on the environment, consuming natural resources in a way that future generations will have the chance to use them as well.

13.4. International obligations of the Republic of Serbia in relation to Renewable Energy Sources.

13.4.1 International Renewable Energy Agency (IRENA)

The main goal of the International Renewable Energy Agency (IRENA) is for it to become the main driving force in the speedy transition towards the spread out and sustainable consumption of renewable energy in the world, and its main activities include:

- Offering concrete advisory services to Governments of Industrialized and developing countries – in regard to the consumption policies of renewable energy resources,
- Transfer of technology and advisory services in regard to project funding,
- Constructing and raising the capacity in the area of renewable energy consumption.

On 26th January 2009, the Republic of Serbia became a member and founder of the International Renewable Energy Agency (IRENA) as the first international (inter-Governmental) organization that focuses solely on renewable energy and will actively continue its participation in the work of this Agency in accordance with the Agency Statute and its interests in the field of activating and consuming of renewable energy sources.

13.4.2 Treaty establishing the Energy Community between the European Union and the Republic of Albania, Republic of Bulgaria, Bosnia and Herzegovina, Republic of Croatia, Former Yugoslav Republic of Macedonia, Republic of Montenegro, Romania, Republic of Serbia and United Nations Interim Mission on Kosovo pursuant to the United Nations Security Council Resolution 1244

The Republic of Serbia ratified the Treaty establishing the Energy Community between the European Union and the Republic of Albania, Republic of Bulgaria, Bosnia and Herzegovina, Republic of Croatia, Former Yugoslav Republic of Macedonia, Republic of Montenegro, Romania, Republic of Serbia and United Nations Interim Mission on Kosovo pursuant to the United Nations Security Council Resolution 1244 (hereafter: Treaty establishing the Energy Community) in 2006.

Article 20 of this Treaty states that every signatory is obligated to submit, within a year of its coming into effect, an implementation plan to the European Commission of the 2001/77/EC Treaty of the European Parliament and Council of 27th September 2001, for the promotion of renewable energy sources derived electric energy production on the domestic market of electric energy and the 2003/30/EC Directive of the European Parliament and Council on 8th May 2003, on the promotion of the use of biofuels or other renewable fuels for transport. The European Commission will forward the plan from each of the signatories to the Council of Ministers for adoption.

The 2001/77/EC Directive defines renewable energy sources; envisions the creation of national indicative goals for the consumption of electric energy produced from renewable energy sources and defines program measures for its achievement, which are revised every five years, and of whose achievement each member state is obligated to inform the European Commission; the obligation of issuing guarantees about the origin of the electric energy produced from RES; the obligation of the member states to analyze and advance the current legal frameworks and administrative procedures necessary for the development and exploitation of power plants which produce electric energy from RES; ascertain the obligation for operators of distribution and transfer systems to accept and transport electric energy from RES with the possibility of allowing primacy in the accessibility to the grid and dispatching, as well as clearly defined technical conditions and tariffs for connecting to the grid and conditions for the rehabilitation of the electric power system.

The 2003/30/EC Directive defines biofuels and asserts the obligation to member states to: put out a certain amount of biofuels onto the market (2% out of the total amount of fuel used in transport sector until the end of 2005, or 5.75% by the end of 2012) and the form in which these fuels may be used; promote their consumption; inform the European Commission every year about the taken steps in the aim of promoting the use of biofuels in transport, the allotted national resources with the aim of producing electric energy from biomass for other purposes, as well as the overall achieved turnover of fuels on the market with a percentage participation of biofuels (pure or as a mixture).

13.4.3 The New European Union Directive on Renewable Energy (2009/28/EC)

In September 2008, the European Parliament passed a set of regulations on climate change which is intended to decrease the emission of Greenhouse Gases by 20%, improve energy efficiency by 20% and increase the overall participation of renewable energy by 20% in the European Union by 2020, compared to 1990.

The new 2009/28/EC Directive on renewable energy sets mandatory national goals which European Union member states need to achieve through the promotion of renewable energy in the sectors of electric energy, heating and cooling in the transport sector, which would help increase the overall participation of renewable energy to 20% in the European Union by 2020. The Directive also envisages that by 2020 the consumption of renewable energy in transportation (biofuels, electric energy and hydrogen produced from renewable energy) reaches at least 10% of the total fuel consumption in the European Union.

In order to reach the mandatory goals, the Directive allows flexibility in cooperation amongst member states, and cooperation with third countries – in relation to Art. 5 – 11 of this Directive.

Member states are required to pass, publish and inform the European Commission about the National Action Plans for the fulfillment of the goals set by the Directive and to provide procedures ready for adoption, authorization and licenses should be simplified so as to remove any obstacles on the market of renewable energy.

The new Directive is the first legal act of the European Union which calls upon the Treaty establishing the Energy Community and envisages ways of cooperation between European Union member states and the signatories for a mutually beneficial relationship.

The preamble of the new Directive (paragraph 37) states: “If by virtue of a decision taken under the Treaty establishing the Energy Community to that effect, the contracting parties in that Treaty establishing the Energy Community become bound by the relevant provisions of this Directive, the measures of cooperation between Member States provided for in this Directive will be applicable to them”.

This is reaffirmed in the text of the Directive, article 9, item 8: “Member States and the Community shall encourage the relevant bodies of the Treaty establishing the Energy Community to take, in conformity with the Treaty establishing the Energy Community, the measures which are necessary so that the Contracting Parties to that Treaty can apply the provisions on cooperation laid down in this Directive between Member States”.

Therefore, when the Contracting Parties of the Energy Community apply the new Directive, they will be able to participate in the measures of cooperation which are available to European Union Member States (statistics transfer and common projects – where physical transfer of renewable energy is possible).

The Directive allows, even before the Contracting Parties implement it, for there to be stimulus for those EU Member States and Contracting Parties of the Energy Community for the development of renewable energy sources. Articles 9 and 10 of the Directive allow EU member States to participate in joint projects with third countries and to include imported electricity produced from renewable energy sources in the national overall target.

Within the joint projects, the Contracting Parties of the Energy Community can count on financial, investment and other types of aid, while EU Member States may benefit from a lower expense level and significant potential for the development of renewable energy in Energy Community member countries.

The start date of the implementation of the new Directive of renewable energy in the Republic of Serbia and other signatory countries of the Treaty establishing the Energy Community will be harmonized within each country.

13.5. Existing Legal Framework

The Energy policy defined by the Energy Law foresees taking measures with the aim of creating conditions of stimulating the use of RES. In compliance with that, the Energy Law introduces the new category of a privileged producer of electric energy, or thermal energy which amongst other things, uses renewable energy sources for the production of energy, and have the right to stimulus, tax, customs and other benefits, in accordance with the Law and other regulations which deal with all taxes and customs, or stimulus and other similar measures.

13.6. Incentive measures and other countries' experience

As a result of the production of electric energy from renewable energy sources, in most cases, being more expensive than from fossil fuels with the use of classic technology, new systems of support have been introduced, that is, financial and non-financial measures of stimulus for investing in power stations that use RES.

The most commonly applied financial stimulus measure is increasing the purchase price of electric energy, which is carried out through two models. The first model is based on a certain amount of electrical energy produced from RES (so-called "green" energy) which will be purchased throughout the year (Quota System). The second model consists of applying the defined purchase price for the supplied electric energy produced RES (Feed-in tariff). In most European countries, the model with the defined purchase price is used (Feed-in tariff).

Along with financial measures, there are often additional stimulus measures being implemented for the production of electric energy from RES such as decreasing or being exempt from paying tax, participating in investments – for selected technologies, which represent the strategic direction of the country.

Stimulating the production of thermal energy from RES for now is being done through the financial support of investments (in the primary phase) and through being exempt of taxes (in the later phases of applying stimulus).

One of the significant characteristics of stimulus measures for increasing the use of RES is the selective stimulus of the development of certain technologies. Apart from financing research-development projects, there is also financing for the development of demonstrative projects. The main criteria for the selection of renewable energy sources and technologies which will be stimulated are the available energy potential, possibilities of the domestic economy and the degree of international development of technology and markets.

13.7 Existing infrastructure in the RES field

The number of constructed plants for the exploitation of RES in the Republic of Serbia and their actual annual energy production are insignificant. The capital invested up until now in these plants is mostly of domestic origin and of little value. Looking at it from a national level, the financial results achieved by the plants constructed for the production of energy from RES are very slim.

Technical-technological characteristics of the equipment which is located in already constructed plants for the exploitation of RES are worse than characteristics of similar equipment being used in European Union countries, which negatively influences the reliability of the functioning, security of production, energy efficiency and maintenance of these plants.

13.8 The state and possibilities of domestic production and research and transfer of technologies

In the Republic of Serbia there are almost no clearly declared manufacturers and maintenance orientated companies of equipment for the exploitation of RES. However, in the field of using watercourse, biomass and solar energy for heating, there are good opportunities for an active participation of domestic equipment manufacturers.

The state of investigation in the field of RES

The state of research in the field of RES is solidly founded in the National Program of energy efficiency of the Ministry of Science and Technological Development. However, the application of the adopted technological knowledge is lagging behind in particular the realization of demo-projects as a result of a lack of stimulus.

The equipment offered on the domestic market for burning biomass is usually not meant for that purpose, but for high quality types of coal, which causes problems during the exploitation and decreases the effects of using biomass as an energy-generating product.

In the Republic of Serbia, there is a big number of producers of furnaces and boilers that work on solid fuels (coal and wood). Even though some of the producers have developed boilers, fireboxes and furnaces for the combustion of certain types of biomass (pellets, logwood, corn remains, and hay), they still do not use the latest innovations and the standards associated with an increase in reliability, the increase level of the utilization of the plant, decrease in the emission of harmful gasses and particles, and not to mention that production of accompanying equipment for manipulating biomass, motors and ventilators is underdeveloped. Local equipment distributors should, apart from steam turbines, also produce all necessary components for the plants which produce electric energy from biomass.

For the development of technology that would produce and use biogas – the transfer of technology is the optimal solution for the development of local companies considering the lack of experience with these technologies. The development should be steered towards the construction of plants for keeping and producing equipment for the transfer and manipulation of waste.

The development of equipment for developing and producing electric energy in small hydro power plants is sporadic given that in the last twenty year the construction of new small hydro power plants was minimal. Estimates are that with the intensification of constructing small hydro power plants and offering support in the Republic of Serbia, there could be a development of mini hydro-turbine production.

When building a hydro-electric power station, a significant part of the investment goes into the construction part (trapping water, supplying water, machine building), while the biggest part of the remaining investments goes into electrical equipment (turbines, generators, regulation and management, transformers).

The local economy has the opportunity to finish construction work and deliver a part of the electrical equipment (small generators and transformers). There are very good conditions for the production of mid-power generators which with their characteristics would be appropriate for small hydro power plants. In the Republic of Serbia there has no been a significant production of hydro-turbines, even though there have been attempts at initiating production of mini hydro-turbines (mainly type “Banki”). They are simple constructions with a lower degree of utility, and are mainly produced in small machine workshops in various towns in the Republic of Serbia. Besides that, there are various companies and workshops in the Republic of Serbia that deal with production or developing turbine prototypes and complete machine assemblies for small hydro power plants, based on project solutions from experts in scientific institutions. These companies could produce turbines with a power of up to 3 MW with the engaging of capacities and potential of equipped workshops of our industrial companies.

Help to potential local equipment manufacturers should be organized through the realization of development (lab tests) and demonstrative projects (real mini hydro-electric power station), with the cooperation of development institutions and through the synchronized assistance of relevant Ministries (responsible for science and technological development, and energy and water management).

The production of certain types of hydro-turbines by local companies would allow for the entire equipment order for the construction of small hydro power plants in the Republic of Serbia, with the possibility of exporting to the markets of neighboring countries.

The production of shafts for wind generators is a field in which it is possible to include the engineering sector, while companies from the electro-industry that deal with the production of electric motors and generators can gradually be included in the projects of constructing wind-generated power stations. The eventual production of equipment specifically designed for wind turbines (aero-turbines) can be expected only after the decision of one of the bigger manufacturers to move their production line to the Republic of Serbia.

It is possible to purchase solar panels on the Serbian market produced by local and foreign companies. As far as the production of panel that directly convert the solar energy into electric energy is concerned, for now there is an attempt being made for the production at the “Mihajlo Pupin Institute”. For a further development of the market that develops equipment for solar power use in the Republic of Serbia, it is necessary to adopt standards and by certification regulate the quality of the product that can be found on the market, by including research institutions in the further developing of this field.

13.9. Identifying hurdles for an increase in renewable energy sources use in the Republic of Serbia

The most significant barrier for an increase in use of renewable energy sources in Serbia are the following ones:

- lack of clearly defined obligations of the operators of transfer or distributive systems to primarily connect producers that use RES onto the grid and that the RES gets priority in the dispatch;
- lack of significant equipment standards and practice/treatment for exploitation of RES;
- insufficient number of regulations needed for developing projects, manufacturing, control and installation of equipment that uses RES;
- insufficient number of accredited certified labs for equipment that uses RES;
- uneconomic prices of electric energy and a disparity of prices for energy-generated products.

A significant administrative barrier when constructing power stations that use renewable energy sources also represents the stipulations of the Law on Public Enterprises and Activities of Public Interest (“Official Gazette RS”, no. 25/00, 25/02, 107/05, 108/05 – correction, and 123/05 – other Law), and in relation to the stipulation of Article 41, Paragraph 1 of the Energy Law.

According to these stipulations, the production of electric energy is a service of common interest, which in the event of commencing production of electric energy in small hydro power plants, requires the carrying out of the same procedure just as for power stations with a power greater than 10 MW.

From the listed regulations it is conclusive that mini power stations, as the most prospective form of electric energy production from renewable energy sources, could take over the production of electric energy. It is necessary that each individual case, by Act of the Government be allowed to perform this service, as a service of common interest. The Government Act is mandatory even when it comes to mini power stations with a power of up to 1 MW, for which there is no obligation of acquiring a license from the Agency for Energy.

The overview of stipulations which have a bearing on the conditions for performing activities of electric energy production which point out the complex procedure that is necessary in each individual case, in order for the production of electric energy in mini power stations with the use of renewable energy sources can commence, and which negatively influences the motivation of potential investors, who – compared to mini power stations – demand the reexamining of the stipulations of the Public Enterprises and Energy Laws, in the hope of simplifying the procedures which lead up to the beginning of the functioning of mini power stations.

Biomass

The most significant barrier for an increase in biomass consumption represents an insufficient availability and experience in using the equipment, as well as the non-existence of a developed biomass market. Aside from that, as a result of an increase in demand for pellets and briquettes in European Union, almost all locally made products are exported. As biomass is a limited resource, it is important to define the overall available quantity of biomass for the production of briquettes and pellets and intensify the consumption of the remaining biomass in a non-refined form, which is economically and energetically more rational in comparison to using pellets and briquettes.

As far as using biomass for the production of thermal energy goes, taking into account the actual prices of energy-generating products, it is economically justifiable to use biomass as a substitute for natural gas or liquid fuels, especially fuel oils, while the low price of coal still does not motivate investors to switch from coal to biomass.

Small Hydro Power Plants

One of the main obstacles for intensifying the construction of small hydro power plants in Serbia is of an administrative nature, because investors apart from the energy license which enables them to build small hydro power plants of an installed power of over 1 MW, have to get technical conditions and licenses from the ministries that deal with water management, forestry, as well as the ministry in charge of spatial planning and municipal bodies in charge of urban planning.

The non-existence of defined compensation and standard procedures, as well as standardized contract forms for using natural resources (water, water terrain, forest terrain) significantly slows down and makes difficult the process of constructing small hydro power plants.

Solar Energy

One of the most important factors that influence the economic justification of installing solar panels for the production of thermal energy is the price of electric energy. In the condition of uneconomic prices of electric energy, the people do not feel a need to install this type of equipment by which they would be able to save money. Apart from this, there is not a standard or control of the quality of solar panels that can be found on the market and this can negatively affect potential investors.

Geothermal Energy

Local self-governments, potential investors and consumers have enough experience when it comes to using geothermal energy.

Wind Energy

By contrast to other RES that have a relatively stable and predictable production, wind power stations have unstable and unpredictable production. As a result of this, for the secure functioning of the electric-power system, it is necessary to acquire a reserve capacity. Furthermore, the fluctuating power of power stations that work on wind power expresses great strain and costs when it comes to balancing the electric-power system, and it is necessary to allow the expanding and reconstruction of the transfer system. This is the biggest technical hurdle for a quicker construction of greater wind power stations.

13.10 Goals and expected results of the Program in the RES field

The main goals of the Program in the RES field are:

- an efficient usage of domestic potential in the production of energy
- decreasing Greenhouse Gases
- decreasing the import of fossil fuels
- developing local industry
- Creating new jobs.

The goal of the Republic of Serbia is to increase the participation of electric energy produced from renewable energy sources by 2.2% by 2012, compared to the overall consumption of energy in 2007, as well as the representation of biofuels and other renewable fuels on the market by at least 2.2%, compared to the total fuel consumption in transport, worked out on the basis of energy content.

The realization of the set goal will ensure the production of “green electric energy” at 739.1 million kWh in 2012, which is enough to ensure the supply of 179.000 households per year (with an average monthly consumption of 350 kWh), and putting on the market 130.000 tons of biofuels in the period leading up to 2012.

For the completion of the set goal of electric energy participation in the overall consumption by 2012, the plan is to attract and engage private sources of funding for the building of 102 MWe of capacity which would produce electric energy from renewable energy sources, and also set the conditions for an increase in production of “green electric energy” by 739.1 GWh. A detailed overview and dynamics of the realization are given in table 13.5.

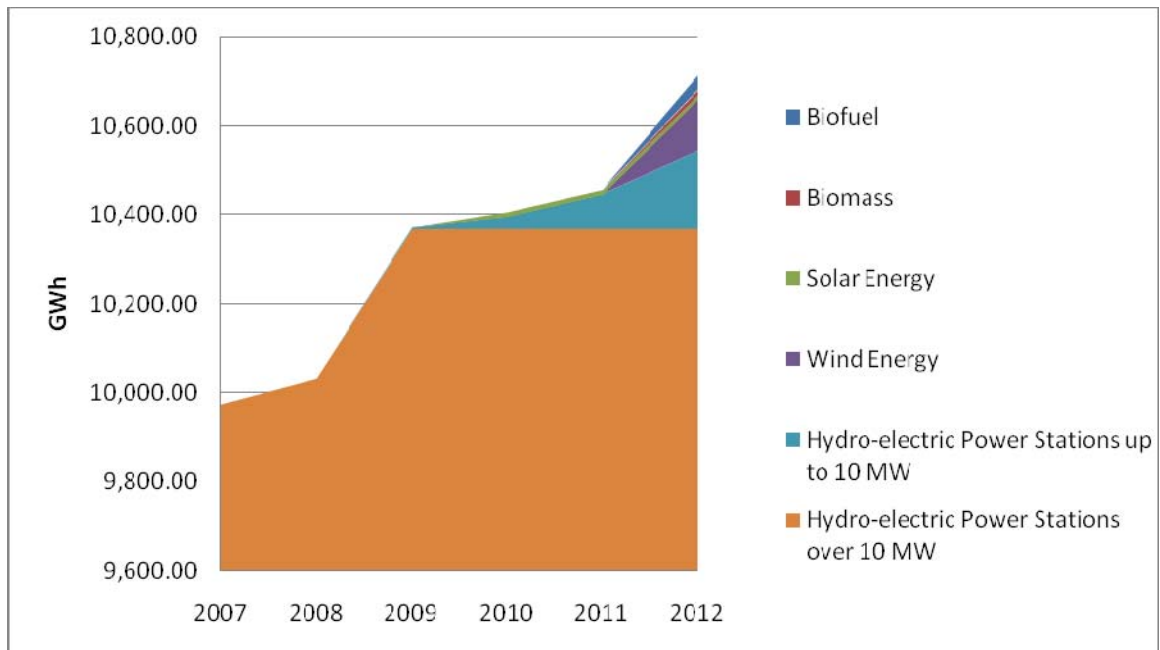
Table 13.5 Dynamics of the realization of goal participation of electrical energy derived from renewable sources

		2007	2008	2009	2010	2011	2012
Hydro-electric power stations over 10 MW	MWe	2.835,00	2.835,00	2.835,00	2.835,00	2.835,00	2.835,00
	GWh	9.974,00	10.032,00	10.368,00	10.368,00	10.368,00	10.368,00
Hydro-electric power stations up to 10 MW	MWe	0	0	1,0	7,0	20,0	45,0
	GWh	0	0	3,9	27,3	78,0	175,4
Wind Energy	MWe	0	0	0	0	0	45,0
	GWh	0	0	0	0	0	114,7
Solar Energy	MWe	0	0	0	5,0	5,0	5,0
	GWh	0	0	0	10,5	10,5	10,5
Biomass	MWe	0	0	0	0	0	2,0
	GWh	0	0	0	0	0	12,0
Biogas	MWe	0	0	0	0	0	5,0
	GWh	0	0	0	0	0	32,5
TOTAL PRODUCTION	GWh	9,974.0	10,032.0	10,371.9	10,405.8	10,456.5	10,713.1
TOTAL CONSUMPTION	GWh	32,946.0	32,946.0	32,946.0	32,946.0	32,946.0	32,946.0
RES participation in the consumption of electric energy		30,3%	30,4%	31,5%	31,6%	31,7%	32,5%

In the observed period, the production of electric energy from renewable energy sources would increase by 7.4% - from 9.974 GWh in 2007 to 10.713,1 GWh in 2012.

The planned capacity involves the construction of at least 45 MWe small hydro power plants, 45 MWe wind turbines, 5 MWe solar photovoltaic plants, 2 MW biomass plants and 5 MWe biogas plants, with a total investment of around 200 million euros by 2012.

Picture 13.2 Planned production of electric energy derived from renewable sources in the Republic of Serbia, according to type



Attracting and engaging private sources of funding as well as financing incentives and support to RES development will be realized by implementation of incentives and mechanism policy for the support to RES development.

The planned increase of biofuel participation in the transport of the Republic of Serbia is achievable by using biodiesel, since there are conditions for its production – from raw material to the production capacity (estimated production ranges from 141.750 to 250.00 tons of biodiesel per annum, depending on the structure of the crop harvest).

The realization of the goal participation of biofuels in transportation is 2.2% by 2012 is feasible by allowing the minimum volume content of fatty acid methyl ester (FAME) in diesel fuels, or the compulsory mixing of biodiesel and diesel fuels, in quantities represented in Table 13.2, under the condition that the overall consumption of crude oil derivatives in transport remains on the 2009 level – 586.332 tons of motor oil and 1.909.671 tons of diesel fuels.

Table 13.6 Dynamics of the realization of the goal participation of biofuels in transportation

Year	Necessary amounts of biodiesel for blend with diesel fuels (t)	Minimum content of fatty acid methyl ester (FAME) in diesel fuels (compared to v/v)	Biodesel participation in the mixing with diesel fuels (energy content)	Biofuel representation in transport (energy content)
2010.	22.047	1.10%	1.00%	0.76%
2011.	44.093	2.21%	2.00%	1.52%
2012.	66.140	3.31%	3.00%	2.28%
<i>SRPS EN 590:2005*</i>	99.873	5.00%	4.53%	3.44%

**According to the SRPS EN 590:2005 standard, the content of fatty acid methyl ester (FAME) biodiesel is limited to 5% v/v*

13.11 Action plan for the realization of the programs in the RES field

Overview of basic activities, whose realization is essential for achieving set goals of the Program in the RES field by 2012, as well as their responsible body and deadlines for the realization is shown in Table 13.7.

Table 13.7 Dynamics of the realization of the measures and activities envisaged by the Program in the RES field by 2012, and the responsible body of their implementation

Activity	Responsible body	Start date / Completion date	Goal/Comment/Activity explanation
Working on the harmonization of domestic regulations that deal with the RES sphere with those of the EU	MME	01/07/2009 / continually	<ul style="list-style-type: none"> <li data-bbox="890 734 1390 913">– Further implementation of the Directives 2001/77/EC and 2003/30/EC and EU regulations in the RES sphere within the Energy Community <li data-bbox="890 965 1390 1182">– Participation in the drafting of the study with the aim of defining the capacities of the Energy Community member states to implement the new EU Directive for renewable energy by 2012 <li data-bbox="890 1240 1390 1384">– Innovation of existing and passing new standards which will deal with projecting, construction and utilizing of the plants used by RES

<p>Removing administrative obstacles for RES consumption – amendments to the Energy Law</p>	<p>MME</p>	<p>Ongoing / First half of 2010</p>	<p>Amendments to the Energy Law should specify the Acts which deal with RES:</p> <ul style="list-style-type: none"> – Adopt clarifications in regards to privileged producers of thermal energy; – Define biofuels which are used as energy-generating products in transport with defined essential bylaws; – Clear definition of the responsibilities of the actors involved on the energy market when it comes to connecting to the network, accepting and dispatching electric/thermal energy, etc. – Broaden the jurisdiction of the Agency for Energy Efficiency of the Republic of Serbia so that it can issue a Guarantee of Origin for electric energy. <p>Removing administrative obstacles identified in subchapter 13.9</p>
<p>Provide funds for the long-term financing of projects in the RES field</p>	<p>MME</p>	<p>01/07/2009 / Continuous</p>	<p>Cooperation with international financial institutions with the aim of acquiring financial aid for the purpose of funding RES projects</p>
<p>Informative, promotional, educational activities and pilot projects</p>	<p>MME</p>	<p>01/07/2009 / Continuous</p>	<ul style="list-style-type: none"> – with the aim of raising awareness of the advantages of consuming RES – with the aim of creating an active business environment for investments in renewable energy projects – Increasing knowledge and information levels of potential investors and local self-governments of the methods and cost effectiveness of using renewable energy sources

PLANNED PROJECTS
– The development of a National Action Plan for the use of biomass as the most important RES in the Republic of Serbia
– The construction of a regional platform for the biomass market development
– A detailed revision of locations envisaged by the cadastre of small HPPs with the aim of making up a precise list of suitable locations for the construction of small hydro power plants
– Measuring the speed and direction of the wind, with the goal of producing an Atlas of winds in Serbia; the development of a study about the possibility of the integration of wind turbines into the electric energy system and defining the need for reconstruction/revitalization of the transmission grid; training the operator of the distributive and transmission systems;
– Examining the possibility of converting 15 heating plants and 15 High Schools (agricultural and forestry) which do not have the capacity of being supplied by gas, to biomass.
– The capacity development for consuming and promoting solar power energy in Serbia
– Examining geothermal potential in the Republic of Serbia

13.12. Stimulating the consumption of renewable energy sources and efficient technologies for the production of electric energy

Article 6, Paragraph 2 of the Energy Law, and the Energy Development Program Strategy of the Republic of Serbia set the conditions, manner and dynamics of achieving the Energy Development Strategy, as well as the power stations which need to be constructed, taking into account the estimated consumption of electric energy and energy-generating products, energy efficiency, the possibility of using renewable energy sources, the possibility of using efficient technologies for the production of electric energy and energy-generating products, and stimulating investments in the energy sector.

Taking this into account, the Waste Management Law (“Official Gazette RS”, no. 36/09) states that waste can be reused in order to get electric energy, and that the same law allows the Minister designated for environment to regulate the way the collection, transport, storage and treatment of waste which will be used as secondary material or for producing electric energy will be handled.

A separate Government Act should deal with incentive measures for investments in the construction of new power stations for the production of electric power from renewable energy sources, the price of electric energy, as well as the relation between the privileged producer of electric energy and the consumer.

13.13 Following through and monitoring the realization of RES Program

The responsible bodys of the essential activities for the realization of the RES Program are the Ministry of Mining and Energy, the Ministry of Environment and Spatial Planning, with the help of the Agency for Energy Efficiency. However, the successful realization of the Program is possible only through the coordinated activity of several institutions, and the active participation of other relevant institutions within their domain.

As a prerequisite for a successful realization of the Program and policies in relation to RES, it is imperative to strengthen all three listed institutions, in terms of the number of employees and their continuous education.

In the aim of assessing reached results, every two years a team of experts will evaluate the real state and establish the level of completion of set tasks and in accordance, update the in Renewable Energy Sources Program.”

Article 2.

This act comes into effect eight days following its publication in the “Official Gazette of the Republic of Serbia”.