

# ANALYSIS OF THE BALKAN COUNTRIES POLICY ON RENEWABLE ENERGY SOURCES: THE CASE OF BULGARIA, ROMANIA AND GREECE

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## **Abstract**

This study aims at describing the different type of renewable energy sources and at revealing the importance given by each country regarding the investments and technologies in the field. Particular attention is given to the potential of renewables and their role in reducing the dependence on energy imports, global warming and environmental pollution.

The article considers four different axes of the national renewable energy policy in the countries analysed. Each axe is described in detail and reveals the support mechanism for promoting renewables. Based on the the most recent data regarding the production of renewables and their share in total energy consumption the study highlights the role played by renewables in each country investigated. The most relevant conclusion of the paper is that the share of renewable energy sources in the energy supply will significantly increase in the future.

**Keywords:** renewable energy potential map, European Union target, gross final energy consumption, gross inland energy consumption.

## **1. RENEWABLE ENERGY POTENTIAL MAPS FOR THE BALKAN COUNTRIES: BULGARIA, GREECE AND ROMANIA**

Renewable energy sources represent the key element of human development in a polluted and overcrowded world, dominated by economic crisis, international terrorism and organized crime. In this context it is essential that countries in the world give more importance to the forms of energy mentioned above and get involved in developing projects for promoting and supporting them. They are a source of stability and security that help create a society less vulnerable to energy prices.

The potential of renewables is significant in the three investigated Balkan countries. Every year Ernst & Young makes an analysis on the most attractive 40 countries worldwide regarding renewable energy markets, renewable energy infrastructures and the suitability for individual technologies in order to establish the Country Attractiveness Indices. According to this analysis from August 2012, Romania ranks on the 14th position (previous ranking was 14), Greece remains at the same level ranking the

18th position (previous ranking was still 18) and Bulgaria occupies the last position compared with the other two countries - 36th position (previous ranking was 35) (Ernst & Young, 2012).

Renewable energy sources such as hydropower, wind energy, solar energy, geothermal energy and biomass can be found on their territory. The distinction between them can be made by taking into account the potential of renewable energy sources.

Greece is considered important for its high solar radiation which provides very good conditions for solar energy exploitation. Its rich solar energy potential has attracted substantial investments in the market until now. (Caralis et al., 2010). In fact it has the best solar potential compared to the other countries analyzed. This country could obtain great benefits from solar energy if it invested in its infrastructure which did not exist (Res Compass Project, 2009).

Romania's potential of solar energy is also significant because more than half of its territory is characterized by an annual energy flow ranging between 1,000 – 1,300 kWh/m<sup>2</sup> per annum (Jacobs, 2011). Due to its position, the country is included in the European B sunlight, having 210 days of sunshine per year (Romania solar and renewable energy, 2010).

Except for solar energy, Bulgaria is considered one of the top countries regarding renewables, especially due to its opportunities for wind energy development (ERBD, 2010). In fact, both Romania and Bulgaria are well known for good conditions regarding wind power plant installations. Wind power is also considered a huge investment potential in Greece, but compared to the latter and Romania, Bulgaria possesses the highest wind potential.

All the three countries have significant hydroelectric resources that could be used for generating electricity, power vehicles and ensure light, as well as heating and cooling.

In Greece, the west and north part of the mainland has significant hydropower potential (Kaldellis, 2008). This potential, partially exploited in recent decades, started to be used a lot more now. The exploitation consists in using both new large hydro plants and small hydro plants, Greece being recognised over the years as an active country in the development of new small hydropower capacity. (European Renewable Energy Council, n.d.).

According to the Energy strategy of the Republic of Bulgaria till 2020 the main objective of the state is the efficiency as regards the use of water resource. In this country hydro power plays a significant role particularly in peak load (Res Compass Project, 2009). The Bulgarian government thinks that there will

be a lot of interested investors in upcoming years in this field, especially in small and micro hydropower plant projects (ERBD, 2010).

When it comes to hydropower, the Romanian potential is great. Despite this great potential, the current generating capacity does not satisfy its power needs (Koroneos and Nanaki, 2007). This problem occurs because in this country and also in Bulgaria buildings are in bad conditions and the technology is outdated. (Wolz et al., 2009).

Therefore, in all the countries analyzed the potential of hydropower production expansion is big, but it should be remarked the hydropower dependence on rainfall which determines annual fluctuations in production (Wolz et al., 2009). It is also important to mention that these countries, especially Bulgaria and Greece are interested in building small and micro hydropower plant so that environmental impact be as small as possible.

From a theoretical point of view, Greece is the second country in Europe (after Italy and followed by Romania) with the highest geothermal potential. (Apostol et al., 2005). Unfortunately, this promising geothermal potential remains still untapped (Caralis et al., 2010), the sector being less developed.

From a technical potential, in Bulgaria the share of geothermal energy represents 7% of the full potential of renewable energy (Strategy Bulgaria, 2011). Although Bulgaria is plenty in reserves of geothermal energy and low enthalpy geothermal waters (ERBD, 2010), practically there is no electricity production from geothermal power plant (Res Compass Project, 2009).

Romania is the third country in Europe with the highest geothermal potential, after Italy and Greece. In this sector the first researches and explorations were made in the sixties, being discovered low enthalpy resources in the range 40-1200 Celsius (five sites have a temperature over 1000 Celsius). These resources are used for heat, but they could also be used for electricity generation (Apostol et al, 2005).

The three countries are also full of forests and agriculture areas that can be used for producing energy biomass. (Mikeska and Holub, 2007). In Bulgaria 60% of the overall land area is represented by arable and agricultural lands, and approximately 30% by forest cover (Res Compass Project, 2009).

Biomass potential is also huge in Romania and comes mainly from agricultural waste (60%) and forestry or wood waste (20%). (Ministry of Economy, Trade and Business Environment et al., 2010) The great density of this country's forests emphasizes the possibility of developing a successful biomass industry (Forest Business Network, 2011). The biomass potential relies also on the possibility of using the land (1-2 million ha) for energy crops (Winkel et al., 2011).

Even if the potential for renewables development is high in these countries, it is not fully exploited and the share of investments for developing the renewable energy technology is low (Apostol et al., 2005). This is not encouraging, taking into account the dependence of European countries on energy imports. According to Eurostat, in 2009 more than half (53.9%) of gross inland energy consumption of European Union came from imports. It should be taken into consideration the fact that the proportion of this energy imported from countries that are not European Union members has risen in recent decades. It is also worrying that much of EU energy comes from Russia, well known for the famous misunderstandings with transit countries regarding the energy price and volume which had represented a threat to European energy security and energy supply (European Commission, 2011).

The security of energy supply can be achieved only by a rational exploitation and use of different sources of renewable energy potential in the region. This will lead to a balanced Balkan development.

Besides the dependence on energy imports, there are also other reasons for supporting renewable energy in the countries mentioned above. The development of renewable energy sources could be an important element of reducing unemployment and poverty which increased in the region over the last years due to global economic crisis. According to Eurostat one of the highest increases was registered in Greece: from 16.8% to 23.1% between May 2011 and May 2012 (Eurostat, 2012).

Jobs created directly or indirectly by investing in renewables could be concentrated not only in the installation, manufacturing, and administration of the technology, but also in the production and distribution of biofuels. According to studies solar PV technology ensures the largest number of jobs per year (Lucas and Ferroukhi, 2011). Another study made by the EU in Romania mentioned that the exploitation of biomass will generate 300 000 new jobs in rural area by the end of the year 2020 and also in every sector of renewables, particularly hydropower and wind power (Res Compass Project, 2009).

Exploiting renewable energy sources in these Balkan countries could be an opportunity for Europe to emerge faster from the global crisis. Currently, due to the disaster at Japan's Fukushima nuclear plant, developed countries like Germany intend to close their nuclear plants in the next 10 years and use more and more the renewable energy sources. (Vasile, 2012)

Today, more and more people ask authorities to pay more attention to investments in renewables because they represent the key to a better and sustainable life (Dijk et al., 2003) improving the quality of the environment and reducing the impact of climate change.

## 2. ANALYSIS OF THE CURRENT SITUATION OF RENEWABLES IN THE BALKAN COUNTRIES

### *Policies and priorities*

Investment in renewable energy represents one of the European Union priorities. The 2009/28/EC Directive on the promotion of the use of energy from renewable sources specifies that European Union should reach at least 20% of the final energy consumption through renewable energy sources by 2020. (European Renewable Energy Council, 2011). According to this renewable energy directive Bulgaria should achieve a target of 16% share of renewables to the final energy consumption up to 2020, Greece 18% and Romania 24%.

The targets established for renewables vary from country to country because of the differences regarding the use of wind energy, solar power, hydroelectric power and other green sources (Mușătescu and Comănescu, 2009). Only two of them expect to exceed the target imposed, namely Bulgaria and Greece, their authorities planning to exceed the target by over 2 percentage point. As regards RES industry, the percentage is even higher.

TABLE 1 - COMPARING THE BINDING TARGETS WITH MEMBER STATE FORECASTS IN THE NATIONAL RENEWABLE ENERGY NATIONAL PLANS (NREAPs) & FORECASTS BY THE RES INDUSTRY

	National Binding Target established by the 2009/28/EC Directive	Renewable Energy Share in Final Energy Consumption forecast in the NREAPs	Renewable Energy Share in Final Energy Consumption forecast by the RES Industry (based on demand assumptions from the NREAPs)
BG	16%	18.8%	20.8%
EL	18%	20.2%	25.2
RO	24%	24%	24%

Source: European Renewable Energy Council. Mapping Renewable Energy Pathways towards 2020. EU ROADMAP. (2011).

Despite all the efforts made and measures adopted in the field in recent years, in 2010 Greece was far away not only from the target set by EU but from the target set by national authorities. The situation was different in the other two countries: Romania almost reached its target for 2020 and Bulgaria was very close to it.

TABLE 2 - SHARE OF RENEWABLE ENERGY IN GROSS FINAL ENERGY CONSUMPTION %

Country	2008	2009	2010	Target
Bulgaria	9.8	11.9	13.8	16.0
Greece	8.0	8.1	9.2	18.
Romania	20.3	22.4	23.4	24.0

Source: Eurostat, 2011

In view of adopting the RES Directive 2009/28/EC and of achieving the target set by the European Union, these three member states established support measures and modified their national regulatory framework regarding renewables having the intention to eliminate the difficulties faced by producers and to increase renewable energy production.

In order to transpose the Directive mentioned above, in June 2011 the Bulgarian Parliament adopted the Act on Energy from Renewable Sources which replaced the Renewable and Alternative Energy Sources and Biofuels Act from 2008.

The law has maintained preferential treatment options for renewables, but introduced certain changes relating to the followings: the energy produced from biomass, the balance of power between renewables producers and grid producers and the prices of energy from photovoltaic which had been greatly reduced (Mineva et al., 2011).

In 2010 the Greek Parliament adopted the law 3851/2010 on "Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change". This law brought a number of changes to the law 3468/2006 on Generation of Electricity using Renewable Energy Sources and High-Efficiency Cogeneration of Electricity and Heat and Miscellaneous Provisions modifying the definitions of tariffs and administrative processes, because it was absolutely necessary to be consistent with the requirements provided by Directive 2009/28/CE.

Although the law tried to eliminate the barriers regarding the authorization process encountered by the renewables producers, a lot of issues concerning the demands for subsidies, the installation of PV systems, the prohibition for exploiting highly productive agricultural land in order to generate electricity remained unsolved (Winkel et. all, 2011).

The Romanian Parliament adopted in June 2010 the Law no.139/2010 concerning the modification and completion of law no 220/2008 for establishing the system to promote the production of energy from renewable energy sources. The law modified and completed the definitions of the concepts referring to renewables for being in compliance with the requirements of the Directive mentioned above (Law Romania, 2010).

New provisions concerning the number of green certificates given for 1 MWh from biomass, biogas, bio-liquids and geothermal were introduced. The law also established an "overcompensation" concept for the renewables technology. The concept was taken into account if two conditions were accomplished: the internal rate of return ("IRR") for a technology was ten percent higher than the value considered

when the promotion system was approved; the producer should obtain the accreditation from the National Energy Regulatory Authority (Winkel et. all, 2011).

The main axes of the national renewable energy policy in the countries analysed had been classified into the following areas:

### ***Supporting the electricity from renewable energy sources***

The governments of the three countries have chosen different ways to support the electricity generated from renewable energy sources.

Among the countries analyzed, Greece is the only one that uses three main mechanisms: a feed in tariff system, a specific feed in tariff scheme for small photovoltaic plants implemented in 2009 and an investment support up to 35-50 % (Maroulis et all, 2011).

The feed in tariff is the most important instrument for supporting renewables in Greece. Law 3851/2010 sets out several conditions regarding the payment for the electrical energy generated from renewable energy sources. The feed in tariff scheme for photovoltaic introduced in 2009 provided favourable conditions for the development of the field, the tariff being determined differently depending on the dimension of the plant and the location.

In the context of the global crisis and its resulting austerity, on February 2012 the Greek Minister of Environment, Energy and Climate Change decided to reduce the guaranteed feed-in tariffs for photovoltaics without retroactive application of the decision (Papamichalopoulos, 2012).

According to Greece's Investment Incentives law 3908/2011, renewable energy sources projects may receive subsidies from the investment incentive fund provided that the subsidy should not exceed 50% of the investment cost. The law also sets the kinds of incentives received and the criteria for granting (Winkel et. all, 2011).

In Bulgaria and Romania there is one key instrument in the field: the feed in tariff system is used in the former and quota obligation schemes in combination with tradable green certificates are applied in the latter (European Wind Energy Association, 2012).

The feed in tariff system was introduced in Bulgaria when the country joined the European Union, namely in 2007. The tariff varied depending on the type of renewables and its level was adjusted by 31 March of each year. In 2011 other changes occurred: the tariff was established for a certain period and the projects using much cheaper technology had a great opportunity to change it (Winkel et. all, 2011).

The new feed in tariff mentioned on July 2012 by the Bulgarian State Regulatory Energy and Water Commission was set for the period July 2012 - July 2013.

In Romania such a mechanism was adopted in 2005, its benefits being that each renewable energy project received one green certificate per 1MWh supplied to the grid. A new support mechanism for renewables was introduced on 13 July 2011, after its approval by the European Commission, producing changes in the followings: the application deadline, the number of green certificates received and the obligation to acquire green certificates (McKenna and Mihăilescu, 2011).

Both in Bulgaria and Romania there are also other sources of funding renewable energy projects such as European structural funds and national funds, but they are not included in a general support scheme (RUSE, 2007).

In conclusion, each country has its own mechanism for promoting renewables. While Bulgaria and Greece implemented a pragmatic feed in tariff system, Romania remains dependent on quota system with tradable green certificates. Among the three countries, Greece ranks the first position due to its support policy instrument at the national level which includes both feed in tariff and considerable investments support, all of them being included in a general support scheme. It can be also noted that each country has improved its legislation in the field in recent years in order to achieve the EU target and the objective of the European environmental protection policy.

#### ***Promoting renewable energy sources for heating and cooling***

In Bulgaria the support mechanisms for renewables heating and cooling appeared when the new RES act entered into force in 2011. The projects regarding RES heating are funded by the following sources: the first EBRD credit line for business, the second EBRD credit line for households, Structural Funds and Rural Development Fund. These funds provide financing for insulation and double glazing measures, solar thermal system, cooling and heating heat pump systems (Winkel et. all, 2011).

The entry into force of the new RES act generated a building obligation for heating. According to it new buildings should use renewables to supply min. 15% of their heating (Winkel et. all, 2011; Legal sources on renewable energy, 2012).

With respect to district heating, there are no support schemes, but the EBRD credit line made possible the implementation of a biomass boiler providing heat to a local, small, district heating network. There is also a feed in tariff scheme for combined heat and power. (Winkel et. all, 2011; Atanasiu, 2012).

The main instruments for promoting renewable heating and cooling in Greece are the followings: a building obligation for heating and investment subsidies for heating and cooling. According to the building obligation all the buildings constructed after January 2011 should use solar panel in order to supply 60% of the hot water consumption. The law also stipulates that the buildings designed after 2019 and public buildings designed after 2014 should use only renewables for their consumption (Fantidis et al, 2012).

As regards the investment subsidies, law 3522/2006 stipulates that small domestic renewables system may receive a tax deduction of 20% which should not exceed 700 euros per system (Karopoulus and Attorney, 2008).

Besides several projects financed from European Structural Funds or the Environment Fund, there are no specific instruments for promoting renewables heating and cooling and no renewable energy sources support schemes regarding district heating in Romania (European Renewable Energy Council, 2009; NREAP Romania, 2010).

An additional instrument for supporting the use of renewables in heating is the Green House program which was launched in 2008 and became operational on July 2010. The program is aimed exclusively for individuals and provides fixed amounts from the Environment Fund in order to help them to replace conventional heating system with renewables heating (Romanian Ministry of Environment and Forests, 2010).

Therefore, we can conclude that the use of renewables for heating and cooling had received little attention in Romania in comparison with the other two countries where support mechanisms are ensured. Being a country with high potential for renewable energy sources, Romanian government should take strong action as regards the support instruments and the development of technologies for renewable heating and cooling. In fact, for a better performance in the field, both Romania and the other two countries should focus on a mix of measures consisting in the followings: the best promotion of technologies, clear obligations regarding the integration of renewables into heating and cooling networks, sure financial incentives, as well as guidance and public information.

#### ***Promotion of the use of energy from renewable sources in the transport sector***

In Bulgaria, the introduction of a quota obligation for biofuels in the transport sector was delayed in 2011 because of the citizens and transport sector protests, as well as the prices increases in the field.

All the criteria regarding the use of biofuels in the transport sector mentioned by Directive 2009/28/EC were transposed in the new Bulgarian RES Act from 2011. The country did not adopt support mechanisms for biofuels generated from wastes, residues and other materials till now (Winkel et. all, 2011). However, in 2007 the Bulgarian authorities approved a National long-term programme for stimulating biofuels use in transport sector for 2008-2020.

In Greece the main tool for promoting the use of renewables in the transport sector is a quota obligation for biofuels which is annually updated. In order to avoid problems of fulfilling the quota, the authorities approved investment subsidies in the field. There are also mechanisms for supporting biofuels obtained from Greek energy crops, but they are considered problematic due to the fact that evaluation criteria are not very clear. Tax exemption for biofuels was eliminated.

In Romania the main instrument in the field is a quota obligation for biofuels. Since March 2011, the exempt from excise tax for biofuels was eliminated (Winkel et. all, 2011). The country transposed into national law the provisions of the EU Directives on environment. According to these directives, Romania should have a 5.75% share for biofuels in the total fuel production until 2010. Romanian authorities specified that the country could not yet meet these conditions (EurActiv, 2008; Budusan, 2011).

In conclusion, among the three countries, both Greece and Romania introduced a quota obligation for biofuels in the transport sector, stating that Romania has not reached the level required by the EU. This means that these countries have realized the importance of using biofuels in the transport sector in order to reduce CO2 emissions. In fact, increasing the use of biofuels in the transport sector represents a way of reducing dependence on imported energy and of ensuring the security of energy supply in the medium and long term.

#### ***Supporting the grid connection of the electricity from renewable energy sources***

The access of renewable energy producers to the grid represents a fundamental condition for increasing the electricity produced from renewables. This can lead to the development of renewable energy plants which will not perform their work in relative isolation from the electricity market (Zane et all, 2012).

The connection procedure for transmission and distribution grid differs from country to country within the European Union and leads to specific situation. Grid connection costs (for obtaining connection) of electricity produced from renewable energy have a significant share in the total cost (Gerwen, 2006).

In Bulgaria the electricity market has not yet been fully liberalized and the market is still characterized by two categories of prices: regulated prices and freely negotiated prices.

According to the new RES Act adopted in 2011, the connection to the grid of renewable energy producers does not represent a priority. This law also violates the European Union Directives because, after achieving the target imposed by EU regarding the share of renewable energy sources in the final energy consumption, the country will stop the instruments for promoting renewables. (Jirouš et al, 2011).

This decision could be explained by the fact that many renewable energy projects completed in the past proved to be only speculative having the intention to block the grid capacities in order to sell them abroad (CHSH, 2011).

There are no supporting instruments for encouraging renewable energy producers to connect to the grid because the authorities did not pay much attention till now to the integration of renewables in the electricity market. This situation generated many grid connection problems encountered especially by wind and solar energy plants.

Currently, Greece accelerated efforts to liberalize the energy market and particularly the electricity market which still remains very concentrated with one company controlling 95 % of the generation and 100 % of the supply market (Maroulis et al, 2011).

In this country there is a single procedure regarding the grid connection which had been improved through the recent law 3851/2010, becoming less complicated.

With respect to the electricity from renewables, the law provides favorable conditions for connection to the grid. Technically and economically speaking, plant operators enjoy the most advantageous connection. Grid operators place great importance on the transport of electricity from renewables in the grid system. The grid connection costs are borne by the energy producers and the other connection issues are established by an agreement contract (Winkel et al, 2011).

Like other two countries, Romania makes efforts in order to liberalize the energy market which is considered a priority by the International Monetary Fund and the European Union. Theoretically speaking, Romanian energy market is fully liberalized for corporate and household customers because half of supply is provided under free market arrangements.

The access and connection to the grid of renewable energy producers is considered a priority at the national level, the situation being regulated by law nr. 22/2008 subsequently changed in 2011 by

Emergency Ordinance no. 88. Currently, there are no problems regarding the operation of the grid, but it is expected that they will appear in future mainly due to the increasing number of wind plants.

Overall, compared to the transmission grid, the distribution grid is not in good condition and although the authorities approved a plan for its development the lack of funds and other obstacles generate difficulties in starting the work (Bozsoki et al, 2011).

In contrast to a feed-in tariff system, Romania is characterized by a green certificate regime, every year the distribution companies being obliged to fulfil a quota of purchased green electricity. If the requirement is not accomplished the companies are penalized (Zane et al, 2012).

In conclusion, compared to Bulgaria which placed renewables behind all the other sources of energy, Greece and Romania provided great importance to the electricity market and to its connection to the grid, offering various facilities to the renewable energy producers. Anyway, the decision of the Bulgarian authorities of stopping the support mechanism for renewables after achieving the EU target raises numerous questions and negatively influences the EU policy for environmental protection. It is also worth mentioning that all the three countries make efforts to liberalize the energy market, this concept being one of the prerequisites for completing the European market integrated energy, planned for late 2014.

### **Renewable energy production**

The table below shows the most recent data regarding the production of renewables in the countries analyzed. This production has grown fast in the past ten years, probably due to the higher prices for gas and oil and also for reasons of environmental protection.

TABLE 3 - PRIMARY PRODUCTION OF RENEWABLE ENERGY, 2000 AND 2010

Country	Primary production (1000 toe)		Share of total, 2010 (%)				
	2000	2010	Solar energy	Biomass &waste	Geothermal energy	Hydropower energy	Wind energy
Bulgaria	780	1475	0.8	63.6	2.2	29.5	4.0
Greece	1403	1985	9.9	44.7	1.4	32.3	11.7
Romania	4040	5677	0.0	69.6	0.4	29.6	0.5

Source: Eurostat, 2012

Biomass&waste energy production occupies the most important position in the renewable energy production in all the countries, the share in total production being closed to 70% in Bulgaria and

Romania while in Greece represents almost 45%. The possibilities for further growth are significant due to the forestries density covering their territory and agricultural potential (Reiche, 2006).

Hydropower energy production also has a large share of total, all the countries having long years of tradition in producing this source of energy. Another similarity regards wind energy production which occupies the third position in all the countries with the highest percentage in Greece and the lowest in Romania. In fact, this source of energy had recently started to be produced in Romania, the reports from 2009 mentioning that there was no wind power production (Wolz et al., 2009).

According to the Ministry of Development the investment in solar and wind energy will increase in the next years due to the fact that Greece energy imports represents more than 70 percent of its needs (Michaletos, 2011). Besides, compared to Bulgaria, solar energy production in Greece is almost 10 times higher while in Romania, solar energy production was not recorded when setting up the analysis. This huge difference between countries cannot be attributed to the solar energy potential, but to the lack of investment which represents the biggest barriers in all areas.

Although the potential of geothermal energy in Greece and Romania is the highest in the entire Europe, Greece ranking in the first position and Romania in the third, the statistics in the table above show that the production is not of relevance. This low production is due to technology and legislation providing strict policies and procedures for environmental protection in Romania (Roșca et al., 2009). In Greece this sector has recently started to grow, a lot of geothermal project being under development because the country intend to increase geothermal installed capacity till 2020 (PPC Renewables, 2011). Bulgaria is not characterized by high potential of geothermal energy; therefore the production in the field is low.

#### ***Renewable energy consumption***

Overall, as can be seen in table 2, all countries had made progresses regarding the share of renewable energy in gross final consumption even if some of them are far away from the target imposed by EU. The growth could be explained by the need to achieve this target, but also by the increase of the renewable electricity technologies in the following sectors: dropower, electricity from biomass, wind power and solar power, especialli photovoltaics (EurObserv'ER, 2012).

Another concept that should be taken into consideration is gross inland energy consumption that reflects the quantity of energy required to cover the inland consumption of the region taken into account. Compared to gross final energy consumption, this indicator highlights the demand for primary energy (Eurostat, 2010).

TABLE 4 - SHARE OF RENEWABLES IN GROSS INLAND ENERGY CONSUMPTION, 2010 (%)

Country	Renewable energy total	Biomass & renewable waste	Hydro	Geothermal	Wind	Solar
Bulgaria	6.1	4.1	1.7	0.2	0.1	0.0
Greece	6.5	3.4	1.6	0.1	0.8	0.6
Romania	14.8	10.9	3.7	0.1	0.0	0.0

Source: Eurostat, 2012

Among the three countries, the relative importance of renewables is highest in Romania. Overall, the percentage is low, because not even 10% of the energy consumed in Bulgaria and Greece came from renewable energy sources.

### 3. CONCLUSIONS

The present work comparatively analyzes the potential, production and share of renewable energy sources in total consumption, as well as the policies and mix of measures adopted by the three investigated Balkan countries for increasing the use of renewables.

After an introduction to the importance of the concepts used, the study reveals the high potential of renewable energy sources in the countries analyzed and their importance in reducing the dependence on energy imports, in creating new jobs and in ensuring environmental protection.

The review of national policies adopted by every country highlights that they are interested in accelerating the exploitation of the large potential of renewables and to reduce barriers encountered by the producers.

The conclusion reached in this article is that even though renewable energy sources do not represent a significant percentage of the overall energy consumption in the countries analyzed, their share in the energy supply will significantly increase in the future. This increase could be explained by the need to achieve EU target regarding the use of renewables in order to protect the environment, but also by the lack of conventional sources which will surely become depleted in the long run. The increasing investments in the field will transform these sources of energy in a major player in the European energy market.

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