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RENEWABLE ENERGY SOURCES IN BIH: QUESTION OF (UN)SUSTAINABILITY

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Renewable energy sources are a topical issue in all developed countries. In Bosnia and Herzegovina, the use of renewable sources in electricity production is quite forgotten and a subsidiary theme, which is inadmissible, given the huge potentials for their use. Bosnia and Herzegovina has significant energy potential, both conventional and renewable. In the first place, coal in the parts of central Bosnia, as well as in the north-eastern part of BiH, and Eastern Herzegovina is imposed. When renewable energy sources are concerned, the most important ones are large rivers, but also smaller flows across BiH, as well as sun and wind energy, predominantly in Herzegovina as well as biomass throughout BiH.

Water potential is mainly exploited in large hydroelectric power plants by three Bosnian-Herzegovinian power companies, while biomass use implies traditional wood utilization as solid fuel in households and local heating plants without any control and limits. It is indisputable that there are potentials of the RES in BH, but the question is their capitalization, ie the exploitation and overcoming of all the barriers they are facing. Bosnia and Herzegovina, unfortunately, has no strategy for the development of renewable energy sources, nor an environmental strategy, but neither laws related to energy efficiency. The reason lies in the lack of adequate regulation, irresponsibility in the implementation of international treaties that take on the political dimension, and the lack of coordination between the state and the lower levels of government. Also, a significant problem is personnel inability, financial constraints in transposing modern technologies, and inadequate public awareness of the need for environmental protection and the development of renewable energy sources.

Key words: *Renewable energy sources, hydro power plants, small hydro power plants, greenhouse effect, environmental protection, solar panels, sustainability.*

INTRODUCTION

If we set to the side the fact that energy is at the very root of European integration (through the Community for coal and steel as the embryo of a modern EU), the growing importance of this issue is at the first place for all national policies in the world, as well as Bosnia and Herzegovina. Whether it comes to energy security, energy efficiency, or renewable energy sources, it is clear that this is a topic that will be at the very top of the EU agenda, its member states, but also aspiring countries for the membership, including Bosnia and Herzegovina. All forms of energy in a certain way have an impact on the environment and have consequences, especially for the production itself. RES are in favor of fossil energy sources, because such energy production, except in the case of large hydroelectric power plants, has a significantly less impact on the environment. Energy consumption, ever since the industrial revolution, has been growing steadily. Today, nothing suggests that its consumption will be reduced in the future. On the other hand, the most important energy resources that drive our world – are not renewable, they are less and less.

Energy is probably the most influential individual factor of everyday life and the most influential vector of all political disturbances, processes and conflicts in the economic and financial sphere. Energy security, its diversification and transformation - conversion, transmission, consumption as well as the complete energy sector (technical, economic, organizational) today represent one of the key issues in the world not only because of limited and uneven availability of resources and security of supply, significant environmental impacts and climate change, which are today in the wake of energy policy and strategy, especially in developing and countries in transition. In particular, questionable technologies based on fossil fuels, which, in addition to the low levels of efficiency and high

environmental pollution, have been a staple of energy in most of the countries of the world, and also in BiH in the last century.

By accepting the EU directives, BiH assumed the obligation to increase the share of renewable energy production in total electricity production, thus contributing to the reduction of negative impacts on the environment. Because of this, neglecting the exploitation of hydro potential in BiH is completely unreasonable and unacceptable. In general there is a negative attitude of the public and the community towards the construction of hydro power plants and small HPP, although these facilities cause the least damage to the environment, of course, with the full definition and application of measures for its protection. Much more work is needed to educate and inform the public in order to promote HPP and SHPP construction. Therefore, activities in boosting the use of hydro potential in BiH need to be specifically directed towards the authorities of all levels, which issue regulations and issue various permits and concessions, to harmonize the regulations and enable more efficient and faster realization of investments in this area.

Bosnia and Herzegovina faces many challenges due to its traditional reliance on fossil fuels, both for the production of electricity and heat, in thermal power plants, boilers and small coal stokeholes, which results in enormous air pollution, especially in the winter months. On the other hand, the use of energy from renewable sources (except hydroelectric power plants) - solar and wind energy, biomass, geothermal etc., is at the very beginning and can not be objectively counted to have a significant share in the near future for a number of reasons (prices, lack of own technology and equipment production, etc.).

This puts the need for their own development and scientific approach to the conquest of new technologies and processes by improving the existing facilities in order to incorporate BH into the modern processes of convergence in low-carbon energy development as quickly as possible.

Today, BiH is the only country in Europe that has neither a strategy nor a law on energy and energy efficiency, an institute or an energy agency, a state regulatory energy commission, an energy balance and energy statistics at BiH level. The disarmament of competencies on the one hand, and the commitments undertaken in the process of integration into international flows on the other hand, results in a slowdown of the objectively possible faster development and use of international financial sources and projects. This is not the case with neighboring countries, which show much more successful progress in energy sector reforms.

ASPECTS OF DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN BIH

Renewable energy sources represent the mainstay of the energy independence of Bosnia and Herzegovina in the future. The total renewable energy potential can meet half of BiH's annual needs, which means that BiH has significant potentials when it comes to the use of renewable energy sources. This is particularly true for hydro- and wind-potential and biomass. According to the budgets of the Energy Community of Southeastern Europe, BiH has a real possibility to increase the share of renewable sources in total energy potential from 26.5%, as of 2005, to 33% by 2020. By using biomass, BiH could produce 18 TWh per year and use geothermal sources of 40.5 GWh of electricity; hydro potential is 6.8 GW, wind potential 2 GW and solar power potential 33 MW.

Current electricity production in BiH amounts to 13,491 GWh. At this point, 54% of production is realized in thermal power plants and 45% in hydro power plants. Only 1% of production is from mini-hydropower plants and other alternative sources of energy. Hence, hydro power plants and thermal power plants dominate primary energy production. If primary and secondary use of energy sources is taken into account, BiH, according to available data, dominantly uses the largest pollutants - fossil fuels. The use of fossil fuels - particularly coal - is closely related to the long tradition of exploitation of this significant energy source in BiH, whose reserves are estimated at 5,464 million tons. Significant reserves of brown coal and lignite influence their further dominant use in the future. While significant progress has been made in exploiting hydro-potential, the use of other forms of renewable energy sources is, unfortunately, in the "second plan". The reason lies in the lack of adequate regulation, irresponsibility in the implementation of the assumed international commitments and the political dimension, the lack of coordination between the state and the lower levels and the lack of adequate "green" programs. Likewise, staffing (non) ability,

financial constraints on transposition of developed technologies as well as insufficiently sensitized public for environmental issues and the development of renewable energy sources pose significant obstacles in development.

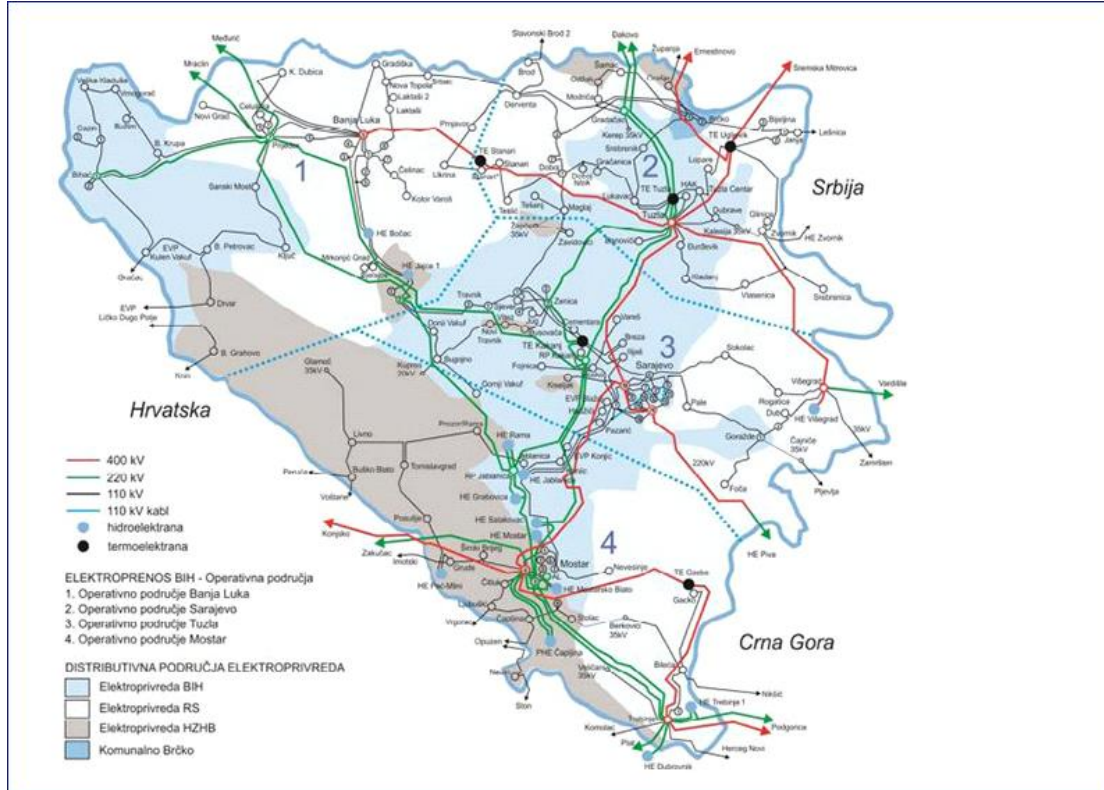


Fig.1. Map of electric power system of Bosnia and Herzegovina with operational areas of electro-transfer of BiH and distributive areas of electric companies (DERK, 2016)

Potentials for obtaining and using energy from individual RES in BiH

When we talk about renewable energy sources in BiH, it is very common to be unclear about this area in the sense that it is believed that the RES only relate to electricity, which in the BiH energy mix (estimated) is 30-35%. The heating segment, ie the production of heat energy, in particular inefficient use of various forms of biomass, such as firewood in households, is very present in BiH.

The total installed electrical capacity of production facilities in BiH is 4,352 GW, of which 2,083.50 MW in larger hydro power plants, and 2,065 MW in thermal power plants. The installed capacity of small hydro, wind, solar and biomass power plants is 112.15 MW, while 91.23 MW is installed in industrial power plants. From the RES' exploited potentials in BiH, most of the water flows and solar energy are used for the generation of electricity and biomass for the production of conventional forms of biomass like firewood, but lately fine shapes such as pellets, briquettes and wood chips, which are used for heating or production of heat energy. Additionally, more attention is paid to geothermal energy or the energy of the environment for heating and / or cooling. If we take for example, the fact, that hydro power potentials have been utilized up to 40%, speaks clearly about BiH's potentials, both on small rivers and large streams such as Drina, Bosnia, Vrbas, etc. These utilizing capacities are reflected in several GWs, so from the current 2.2 GW of installed capacity, BiH could climb to 3 GW with the exploitation of technically usable, economically justified and environmentally acceptable. With respect to all aspects, such capacities could be capitalized, as is the case with the Brežice hydroelectric power plant on Sava.

It is clear that there are significant unused water capacities in BiH as well as problems of political and ecological nature; (operations, accumulation - karst and groundwater, basins, optimal equipment). There is no conceived integrated strategy for hydroelectricity development and management within the wider water and environmental complex, including all legal, economic and institutional aspects. There is a "mature" technology for all HPP sizes; but it is not known whether there is any problem in exploitation under applicable and sub-optimal loads (hydrodynamic instability, water strikes, vibration, reduction of efficiency, availability, lifespan ...) in BiH. There is also no experimental infrastructure for laboratory testing of behavior and performance on turbine models at different loads and working conditions. For small HPP it is evident that project hydrological data is often unreliable; Some plants are overcapacitated, working under sub-optimal conditions - at significantly lower forces, leading to a significantly reduced level of activity and can cause vibration and mechanical damage.

The total available hydropower potential in BiH is estimated at approx. 6126 MW of installed power and approx. 22000 GWh of production, while the total installed capacity of all HPP in BiH is approx. 2440 MW. Further, the utilization of hydro potential in relation to the available one in BiH is approx. 39.8%. In the past 30 years, only HPP Mostarsko blato with power of 60 MW and 54 mini hydro power plants (MHPP) were built in BiH, with a total power of 65.54 MW, which is only 2.7% of the total built HPP or 1% of the available hydropower. At this moment, it is difficult to estimate how much of the available hydropower potential can be utilized, as there are no up-to-date studies, projects and research, and in the meantime there has been a change in the physical condition in space and on the ground.

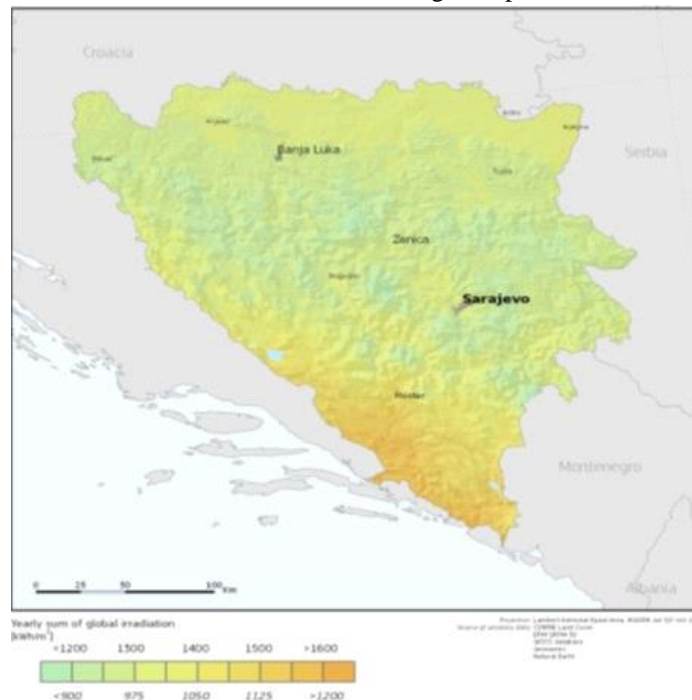
When it comes to biomass energy, fine forms of renewable biomass fuels such as pellets and briquettes (about 50 producers in BiH) are mostly exported, and what is being sold and used to produce heat on the domestic market is of unknown or poor quality. The annual production of pellets and briquettes in BH is estimated at about 300,000 tons, which, viewed from the aspect of demand, has become insufficient. The demand for pellet production in BiH is estimated at about one million tons per annum. Also, the largest consumption of biomass is recorded as heating wood in households or wood chips and other residues from the wood processing industry in district heating systems.

Problems with laws and bureaucracy hampers the production of energy from renewable sources in Bosnia and Herzegovina. Specific activities are needed to unlock the potential, open up new jobs and attract investment. Renewable energy sources by 2020 should participate in total energy production in BiH with at least 40 percent. However, the question is whether BiH will fulfill this goal, especially when it comes to biomass energy. The first plant in BiH to produce bio-gas from manure in Laktasi, in the northwestern part of the country, is eight years old. In its construction and equipping, 300,000 euros was invested in total. It is one of the Caritas projects, with the aim of opening up new jobs, and developing and improving livestock production. Although technically operational, the plant does not work. Namely, the problem lies in the different interpretation of the law between the regulator and the operator. If the plant were working and it was technically operational, complete energy would go into the grid and

the plant wouldn't be able to use any of it. An additional problem is that there is no state strategy, no law, when it comes to producing electricity from bio-gas or biomass. Today, wood is the largest source of bioenergy, but others can also be used, such as wood waste and organic components of industrial waste. Even waste from landfills can be used as a source of biomass. BiH has enviable potentials of biomass, which is in favor of the fact that almost 50 percent of Bosnia and Herzegovina's territory is covered by forests, and we should not ignore even biomass created in agriculture.

When it comes to solar energy, it is very important to differentiate the use of this form of energy to heat up hot water through solar panels or collectors on the one hand, and the production of electricity through photovoltaic modules on the other. The difference is in purpose, technology, the level of investment costs, administrative procedures for obtaining permits, capacities and so on. Using solar power through solar panels or collectors is much simpler and does not require permission to obtain. Technology is quite simple and is produced in BiH as well. The use of these systems is primarily meant for large consumers of hot water such as hotels, hospitals, sports halls, where it is suitable, or where there are plenty of sunny days like Herzegovina and other areas of BiH. This technology has not yet experienced any major expansion, but there are predictions that the cost of these technologies will fall, and therefore the demand will increase.

When solar energy is used for the purposes of electricity production, that story becomes quite complex for several reasons. First of all investment costs, then project preparation, collection of all necessary permits, and field implementation itself. These processes in BiH last for three to four years, and great efforts are being made to overcome these barriers. The technology of photovoltaic modules has been developed and is still produced outside the borders of BiH, which creates a negative picture of the foreign trade balance of BiH. However, exploitation of



this form of renewable energy for the purpose of electricity generation has been developed in BiH. This is also supported by the fact that up to 140 photovoltaic power plants have been built so far in BiH that are in the system of incentives. This means that all electricity producers from the Sun are privileged, that is, they receive far larger (so-called) tariffs for the sale of electricity from the reference ones. This money is actually the money from the final consumer accounts that is collected through a system of renewable energy sources, which is 0.001976 KM / kWh in the FBiH, while in Republika Srpska it is 0.0044 KM/kWh. Thanks to this incentive system, solar power plants are profitable within five years. As far as this market is concerned, the fact is that all dynamic solar energy quotas are reserved by 2020, except in Republika Srpska, where there are still free quotas for solar power plants over 250 kW of installed power. Investments in

photovoltaic technology are steadily falling, and the question is only when it will become profitable for ordinary households to install the required PV module capacities that will be able to meet their own needs and / or generate electricity in the network and thus "compensate" the consumption with production. Still, this principle of net measurements, without incentives, is not developed and profitable in BiH.

What about future?

The projected target of BiH's gross final energy consumption from the RES in 2020 of 40% of NREAP was adopted based on the base of 2009, when in the energy mix of gross final energy consumption in BiH, renewable energy accounted for 34%. The trajectory on which BH is now located is not entirely clear because BiH does not have precise data on the share of energy from the RES to gross final consumption. The estimates made by the Energy Community Secretariat indicate a percentage of about 42% of the RES share in gross final energy consumption. This means that BiH has already fulfilled its goal. However, there is a need to be careful, especially in the energy and heating biomass energy-related segment, where household data is very questionable and have a strong impact on the overall gross final consumption of energy from the RES to BiH. Specific data from the energy balance and strategic documents indicate the planned use of biomass for heating in 2020 of 1,081 ktoe of heat energy and the use of this energy 1,392 ktoe in 2014. There is a clear difference between these numbers, and therefore the data is too questionable. There is a somewhat clearer picture in the electricity segment where estimates are that BiH has come closer to the set target for years, so recent analyzes point to oscillation in production and electricity consumption from renewable sources, most depending on large hydroelectric power plants. Progress in the construction of the power generation plant from the RES is visible, the most established system of incentives, so-called feed in tariffs - FiT, so now in Bosnia and Herzegovina is built and connected to the grid the total number of 238 plants of the total installed power of 106.7 MW, out of which is the hydro with 84% of installed capacity, then solar with 14%, biogas 0.9%, biomass 0.2%, wind 0.3%, and other plants with 0.4%. In addition, in the FBiH there is also a solid biomass plant with a installed capacity of 8.1 MWel within an industrial plant that is not in the incentive system.

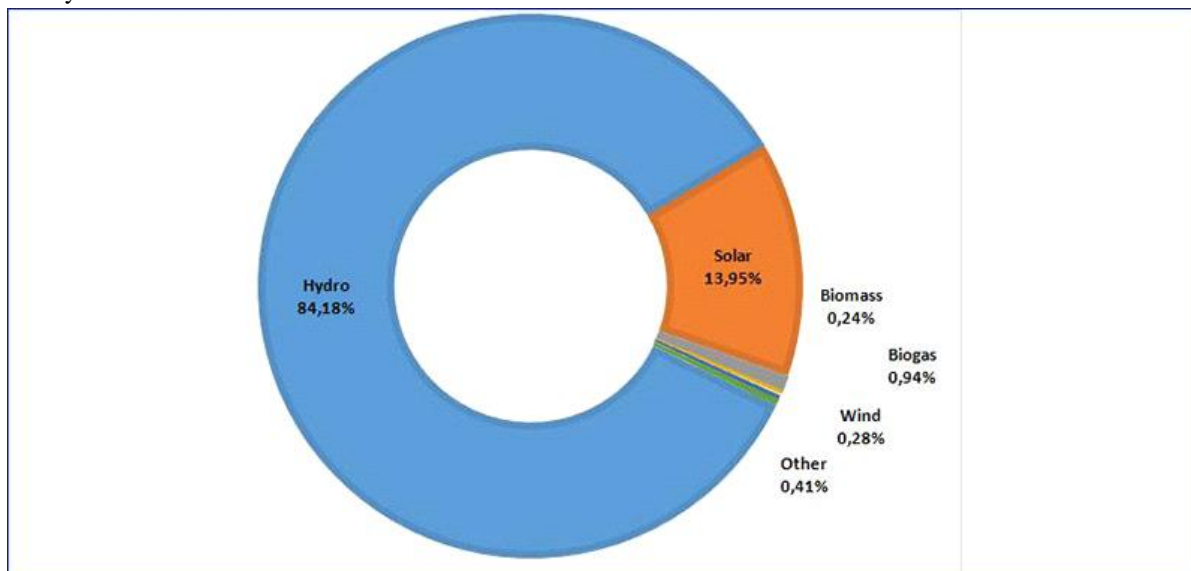


Figure No.3 Share of RES technology in installed capacity for electricity production in BiH under FiT tariff (author: N. Harbaš)

The aim of increasing the share of RES utilization in gross final energy consumption should be to create additional value at domestic level, ie the use of those forms of RES and technologies that will create jobs at the domestic level and contribute to the sustainable development of the country. The fact that we are on the right track, is shown by the numbers about employment in the biomass segment, ie production of equipment, boilers and kilns, pellets, briquettes and other forms of biomass, who in the complete supply chain employ domestic labor. Along with the regulated market of this segment, it would certainly be a viable development.

Some indisputable measures such as reducing energy consumption by increasing efficiency in all chains of energy chains (conversion, transport, consumption) should be implemented in a plan and without delay with full and systematic support from the state and international funds. It is also necessary to insist and stimulate the replacement of fossil fuels by renewable energy sources and the introduction of unpolluted energy and production technologies in every opportunity and wherever possible. However, the path towards the full realization of low-carbon development is undoubtedly complex, uncertain and expensive. The precondition for creating a reliable scenario and a viable strategy requires previous analyzes and decisions on a number of issues. One of these issues is a realistic assessment of energy needs in the medium and long term, taking into account realistic scenarios for improving efficiency and reducing consumption. Which of the many real options provide the fastest approximation to the set goals? Total installed capacity of renewable energy production (excluding large hydro power plants) - albeit very different in some regions - are still small and subsidized all over the world. When will the prices of investment and exploitation in the world, and especially in BiH, become competitive with conventional technologies? Should a further perspective (2050) count on new energy technologies: the new generation of nuclear reactors, the use of thorium, solar-thermal, photon-based nanotechnology, fuel cells, ...? These are just some of the issues that need to be resolved if we want to create reliable scenarios and achievable strategies when renewable sources are concerned.

The problem of administrative organization of the state and entities for RES

BiH has a very complex administrative organization with more levels of government, from the state level, through the entities of FBiH and RS, Brcko District, cantonal levels, to the lowest levels of the local community. BiH has 14 governments including the Council of Ministers of Bosnia and Herzegovina, where there are around 180 ministries competent for various areas. Energy is at entity level, and coordination is conducted by the State Ministry of Foreign Trade and Economic Relations of BiH. Such a complicated administrative apparatus in BiH hampers many projects and is a barrier to investment. This is the case with the RES, where the greatest barriers are the lack of information, the vertical and horizontal communication between different levels of government, then the lack and incompatibility of strategic and plan-spatial documents, and the consent of all decision-makers when issuing a concession for natural resources. By simplifying the process of issuing permits and licenses currently underway by international organizations in BiH, together with local institutions, it would facilitate the promotion and use of RES. Obtaining approvals and permits for installing plants using renewable energy sources is a very complicated and long-lasting procedure.

As some of the solutions, there could be training and creation of professional staff to work more efficiently on strategic planning at all levels of government, then harmonization of all horizontal and vertical strategic plans, the timing of implementation. For example, at the local level there is a delay in the alignment of entity (cantonal) plans, so there is a need for planning at the communal level (lower level plans).

IMPLEMENTATION OF INTERNATIONAL OBLIGATIONS

Bosnia and Herzegovina should demonstrate its commitment to renewable energy sources and complete the legislative framework in this area. As a signatory to a series of international agreements and conventions relating to environmental protection and renewable sources (Energy Community of South East Europe, the Framework Convention on Climate Change, the Kyoto Protocol, the Espoo Convention, etc.) and the Stabilization and Association Agreement itself, Bosnia and Herzegovina committed itself to respecting them. EU Directive 2009/28 / EC - The members of the Energy Community have committed themselves to the implementation of a series of EU Directives, including Directive 2001/77 / EC, 2003/30 / EC and 2009/28 / EC. These directives relate to the obligations of EU members or signatories to work on the development and wider application of different renewable energy sources in the energy sector and transport. In particular, Directive 2009/28 / EC provides a framework for the harmonization of activities and legislation related to the application of green technologies.

Compliance with the provisions of the 2009 Directive would for BiH mean that the share of renewable sources will increase by 2% in the next two years, ie by more than 6.5% in 2020 (to 33%). By signing the Treaty on the Common Energy Market of South East Europe as well as other members, it is committed to taking over the European acquis in the field of energy and environmental protection. UN Framework Convention on Climate Change (UNFCCC) - BiH ratified the Convention on 06/12/2000 Since we are not a developed country (we do not belong to Annex I), we have no strict obligation to reduce greenhouse gas emissions but we have general obligations pertaining to the calculation of annual greenhouse gas emissions, the implementation of measures to regulate anthropogenic emissions and measures to adapt to climate change, the acceptance and development of technologies that limit and reduce greenhouse gases... Also, we must work together to prepare conservation measures in the field of water resources and areas affected by droughts and floods. We have to systematically follow the climate and climate change, report on it and include these estimates in different economic and development strategies. The signing of the Stabilization and Association Agreement with the European Union of BiH obliged the implementation of a number of directives related to sustainable development and environmental protection, ie the adoption of environmental policy. However, the implementation of the above mentioned protocols, conventions and directives faces significant difficulties due to the lack of an adequate institutional and legislative framework.

The implementation of laws and energy projects

Although BiH and its entities have adopted a number of laws that respect and anticipate the use of renewable sources - biomass, hydro potential, wind power and solar energy - in practice, significant results are achieved only in the use of hydro power from small hydro power plants. In the FBiH there is a legal obligation of the power companies to buy electricity produced in mini hydro power plants or renewable sources. Construction and investment in 200 small hydropower plants are ongoing. The construction of small hydropower plants is most economical and simpler, so further development is expected in this area.

In the future, further significant allocations for the construction and revitalization of hydro and power plants are expected. Modernization of thermal power plants implies, inter alia, the possibility of using combined techniques and biomass. FBiH intends to increase the participation of thermal power plants over the next five years through the construction of new capacities for 1470 MW and revitalization of existing ones by 1065 MW. The capacity increase in the hydro power plant should be 1043 MW or 90 MW. Instead of building new ones, emphasis is put on the revitalization and modernization of existing plants, which is a cheaper alternative. However, tendencies in the west go to reduce the share of thermal power plants in primary electricity production. That is why Bankwatch has criticized international financial institutions for investing in energy projects that use fossil fuels, especially in the Balkan countries.

From 2002 to 2009, the European Investment Bank has invested 50% in energy facilities in the region that use fossil fuels and only 9% in renewable energy sources. The European Bank for Reconstruction and Development has also invested 52% of its funds in conventional energy sources and 27% in renewable energy sources. The reasons for this unfavorable investment structure are linked to the lack of adequate energy projects and administrative obstacles.

BiH has a significant problem because of the absence of a state body to deal with renewable energy sources. Basically, problems related to the poor use of clean energy sources are, in addition to the lack of adequate regulation, and the lack of statistical, input data, lack of information, lack of incentives for the use of renewable sources, high cost of building energy systems and significant administrative barriers for potential investors insufficient research on potentials with renewable energy sources. Although there is no global consensus yet, the transition to low-carbon development seems inevitable; questions are only when, how and with what dynamics, there are still large differences between countries and regions in the world. With its geographic position and the commitment to join the European Union, BiH will have to follow the policy and strategy of the energy sector in the EU, which in this process is predominant in the world with radical measures and everything that implies it. Given the modest economic potential, resource specificity (high presence of coal), the consistent implementation of the EU's energy and environmental policy in the planned period represents serious (perhaps ineffective) challenges despite the prospect of using EU funds.

RES and the public

Citizens' awareness of renewable energy sources, whether it is electricity production or heat or whether it is environmental impact, is still at a very low level. The information on the increase in fees on electricity bills in BiH mostly goes unnoticed because it does not represent a high item, both for the citizens themselves - the final consumers of electricity and the media. Probably because one household average on a monthly basis gives only 1 KM or 50 cents in the form of compensation for the RES and for this there is no gain for the investment as a physical person, the capability of net measurement and the like.

A significant problem in BiH is the fact that there is insufficiently developed awareness of the need for environmental protection and the application of renewable sources. There is a need for education as well as profiling of the staff structure to deal with the issue, thereby strengthening the capacities in state institutions and agencies. There are certain moves in this respect when it comes to the role of the media, the social community and the decision makers. In the Parliamentary Assembly of BiH, the Green Parliamentary Group was formed as part of the group, which includes another 87 members of regional parliaments. Likewise, the Balkan Environment Life Leadership Standards (BELLS) analysis has shown that more than 60% of Western Balkan residents are not satisfied with the quality of the environment, and 80% think that their knowledge related to sustainable development needs to be improved.

WHEN "RENEWABLE" BECOMES HARMFUL

Small and mini hydro power plants, which produce between 100 kW and 10 MW of electricity, often produce enough electricity to be integrated into the power grid. Such facilities do not require accumulation and do not disturb the flow of rivers or streams, and can be very effective in delivering network energy in those areas where there are watercourses or waterfalls. However, large hydropower plants cause problems with water management, disturb landscapes, have influence on flora and fauna, on greenhouse gas emissions (methane releasing from flooded soil), affect drinking water quality (changes in dissolved water and oxygen levels, presence of toxic substances, changes in temperature and acidity, obscurity and others) and create noise and negative visual effects for residents in the environment. Large dams can cause hundreds of thousands of people to be displaced, destroying their lives and communities. Providing adequate compensation, relocation and reconstruction can prove to be very difficult and, in many cases, communities affected by such projects remain in a much more difficult position than they were before the project.

The World Commission on Dams estimates that 1-28% of total global emissions of gases that cause the greenhouse effect are fueled by hydroaccumulations. In some cases, the emissions from the accumulation may be equal to or greater than those from coal or coal thermal power plants; the emissions are the largest in shallow, tropical accumulations. The hydrological cycle is renewable, but large hydro power plants do not use watercourse alone, but hydro accumulation, which in some cases are being reduced very rapidly (accumulations around the world loses

their capacity by the sedimentation at an average rate of 0.5-1% per year). Floods that have the characteristics of "river-drainage" - those that do not have significant amounts of water and which depend mostly on the constant flow of water to produce energy - may generally avoid increasing sediments. It should be said that the term "river-drainage" is an incorrect definition and is increasingly used as a synonym for "small influence", which is often far from the truth. Hence the hydro power plants can be considered as energy producers from renewable, potentially renewable or non-renewable sources, depending on the quality of each individual project.

DISCUSSION AND CONCLUSION

Renewable energy sources represent a potential that will significantly contribute to the structure of meeting the energy needs in Bosnia and Herzegovina in the future. Today's expectations are higher than the current technology can provide, but given the continuous advances in technology, it is likely to be expected that current expectations for the next 20-30 years will no longer be unrealistic. The question of energy security and stability has become the cardinal issue of the world's economic, economic and social system in recent years.

According to current economic relations in energy, renewable energy sources are more expensive than fossil fuels or nuclear power plants, so the rise in energy prices will have a beneficial effect on the economy of renewable sources, as it will reduce or eliminate subsidies and plants using renewable sources will be competitive. It is expected that technological progress will be made towards mitigating or eliminating negative impacts on energy production in those technologies that are climate-dependent (sun, wind and others), primarily in energy storage technologies. Significant progress of all technologies is expected. Climate awareness and accountability for the use of renewable energy sources, not only in the category of economic interest, but also in the contribution of every citizen and firm, is especially expected. When further exploitation of the hydro power plant is needed, design experts and environmental protection experts are also involved in the design of technical solutions in order to find acceptable solutions from the social and energy standpoint. For hydropower plants, it is necessary to protect potential locations for a short period of time, as other areas of the terrain reduce the potential of hydroelectric power plants. A key role in the more substantial use of wind power in BiH will have, along economic and financial measures, the solution of the problems of wind power integration in the power sector through the development and improvement of the current practice and the implementation of advanced regulation measures, including the forecast of wind power generation. The use of solar collectors will increase significantly.

Geothermal energy, although local in the area of sites is useful and interesting to potential investors because of high specific investments, probably will not play a significant role in the BiH energy sector, but every potential should be exploited if it is economically justified. Utilization of biomass energy will be one of the very important parameters in the sustainable development of rural areas, waste management, agriculture and forestry. Therefore, due attention should be paid to incorporating biomass energy production and to integrate it into the development of other sectors. The global perspective on alternative and especially renewable energy sources has changed significantly in the last two decades. The reason for this is certainly raising awareness of the consumption of conventional energy sources but also of the accelerated global climate change. Today, alternative energy is not only a way of solving energy problems, but also security (political and economic) issues, environmental protection, education, employment as well as equality of classes and poles.

Bosnia and Herzegovina is a country that still largely relies on conventional energy sources, mostly wood and coal. According to the statistics agency, in 2013, total amount of average gross wood mass measured at 4,024,171 m³ and coal 747,023 tons. These are alarming data if we take into account that these energies are not renewed or in the case of wood, they are very slowly restored.

Although BiH has taken over a number of international obligations in terms of "green technologies" and the protection of the human environment, it is evident that we will lag behind in this area too after our neighbors. The poor economic situation and the lack of financial resources will have an impact on reliance on cheaper and more accessible resources. And the use of a large part of these resources has negative repercussions on the world around us. Certainly, BiH will need to assume a more active role in the use of European Union funds in the field of Intelligent Energy projects in Europe and a number of environmental related projects. The use of funds presupposes

serious legislative, technical and personnel preparation; however, the benefits are manifold. They are reflected in a large number of possibilities: from creating new jobs to more environmentally friendly living conditions. Climate change as a consequence of pollution will remain a problem for the long term not only in our country but also on the planet as a whole; just as the issues of sensitizing the public for sustainable development. For the sake of reliance, shifting responsibilities from one to another as well as closing the eyes and avoiding dealing with the problem can only lead to a disaster. Our civilization needs a global energy revolution - those of renewable energy sources. Indeed, without drastic changes in that direction, without overcoming this challenge, everything becomes questionable - and also the survival of our civilization.

In the end, there is no need to discuss the potential of renewable energy sources in BiH; rather, it is necessary to focus as soon as possible on addressing different barriers in order to use these potentials, otherwise everything remains only on potentials and has no social benefit. Thomas Edison has long since 1916 said: "You should know how to use the natural forces and so get all the energy you need. The sun's rays are the form of energy, wind and sea currents are also energy. Do we use them? Oh, no! We burn the woods and coal, as if the tenants burn the front door of our heating home. We live as wild immigrants who do not realize that these wealths belong to all of us. "

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