

THE PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES IN THE REPUBLIC OF SRPSKA

Velinka TOMIC¹, Svetlana ANDJELIC²

¹ *Regulatory Commission for Energy of the Republic of Srpska, Kraljice Jelene Anžujске 7 Street, Trebinje, 89101, The Republic of Srpska, Bosnia and Herzegovina, Tel.: +387 59 272 415, Fax: +387 59 220 430,*

Email: vtomic@reers.ba

² *Information Technology School, Savski Nasip 7 Street, New Belgrade, 11070, Serbia, Email: svetlana.andjelic@its.edu.rs*

How to cite: TOMIC, V., & ANDJELIC, S. (2021). "The Production of Electricity from Renewable Energy Sources in the Republic of Srpska." *Annals of Spiru Haret University. Economic Series*, 21(4), 309-318, doi: <https://doi.org/10.26458/21417>

Abstract

Reducing greenhouse gas emissions by at least 55% by 2030 requires higher shares of renewable energy and greater energy efficiency in an integrated energy system. The RS produces electricity from different sources. The Thermal power plant "Ugljevik", a relatively small plant, emits unimaginable amounts of dangerous sulphur dioxide. Bearing in mind the share of energy from fossil fuels, the question for the RS is how to provide enough energy to future generations? The development of the RES production in the RS is a crucial challenge for policymakers nowadays. This transformation will improve our health and well-being, create jobs, generate investment and innovation, reduce energy poverty and dependency on energy imports and strengthen the security of supply.

Keywords: *The Republic of Srpska; renewable energy sources; greenhouse gases; power plants; feed-in tariffs; premium.*

JEL Classification: Q4, Q42, Q48

Issue 4/2021

Introduction

Climate change and environmental degradation are existential threats to the world. Through numerous agreements and adopted documents, both the world and the European Union (EU) committed themselves to reduce pollution on the entire planet. EU member states have committed to make Europe the first "green continent" with 0% pollution by 2050. This means abandoning energy production from fossil fuels and completely switching to electricity from renewable sources because 75% of total greenhouse gas (GHG) emissions in the EU come from the energy sector. [European Commission, 2021]

Bosnia and Herzegovina (B&H) and The Republic of Srpska (the RS), as one of two B&H entities, is signatory to the numerous agreements on climate changes, reduction of GHG emissions, as well as the Treaty establishing the Energy Community (EC). By transposing EC directives into national legislation, under the Treaty, BiH is taking steps to achieve its goals. [European Commission, 2009]

Table 1. Production of electricity in the RS

| Power plants by technologies | | Number of plants | Installed power | Realized production |
|------------------------------|---|------------------|-----------------|---------------------|
| | | | (MW) | (GWh) |
| 1. | Thermal power plants | 3 | 900 | 5.287,22 |
| 2.1. | Hydropower plants (>10 MW) | 3 | 730 | 1.776,43 |
| 2.2. | Small Hydropower plants (≤ 10 MW) | 44 | 99,77 | 220,37 |
| 2. | Hydropower plants (TOTAL) | 47 | 829,77 | 1.996,80 |
| 3. | Small SP | 97 | 11,41 | 11,66 |
| 4. | Biomass/biogas power plant | 3 | 2,12 | 12,37 |
| 5. | Total | 150 | 1.743,29 | 7.308,05 |

Source: Author's calculation based on data from *Regulatory Commission for Energy of the RS (2020)*

The production of electricity from renewable energy sources (RES) in the RS is regulated by numerous laws and bylaws. The government of the RS adopts the Action Plan of the RS for the use of renewable energy sources, the share of energy from renewable sources in gross final consumption of electricity, heating and

cooling energy and energy in transport. In addition, the law on RES and efficient cogeneration regulates planning and encouragement of production and consumption of energy from renewable sources and in efficient cogeneration, technologies for the use of RES, incentive measures for production of electric energy using RES and efficient cogeneration, implementation of a system to encourage production of energy from RES and construction of a plant for production of electricity from RES and other issues relevant to this area.

What is the share of RES production in total production in the RS? What is the share of production from solar power plants in RES, and what is the perspective of production from this energy source in the RS are answered in this paper.

1. Production of electricity in the RS

The RS produces electricity from different sources. Data about electricity production in the RS in 2020 are presented in the table above.

The RS in 2020 produced 7.308,05 GWh of electricity, which means the RS produces enough electricity for its own needs and the international market. These data do not include low-power plants for electricity production for their own needs because such power plants do not need to obtain a license to operate. The most important natural resources nowadays in use for energy production and supply are coal and water streams. In addition to these resources, the RS also has electricity production from biomass and solar energy.

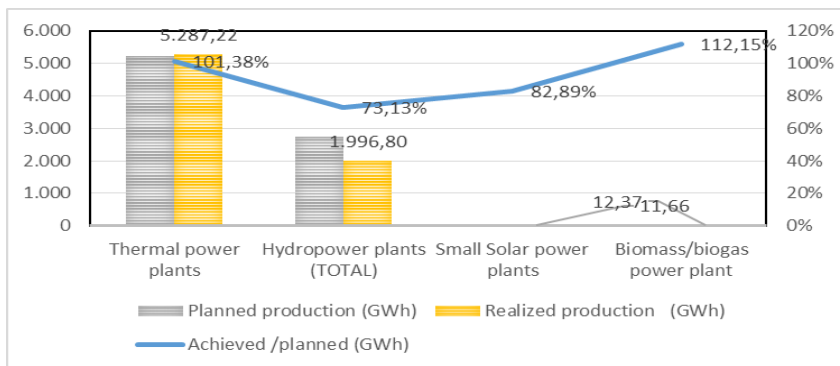


Fig. 1. Planned and realized production of electricity in 2020

Source: Author's calculation based on data from *Regulatory Commission for Energy of the RS, 2020.*

Issue 4/2021

Graph 1. provides an overview of the total realized electricity production during 2020 in power plants that supplied electricity to the grid for the needs of customers in the public service system or the market and a comparison with the planned values.

As we can see from the previous figure, the most significant share of electricity production is from thermal power plants. The most critical impacts of the energy sector on the environment in the RS are emissions of pollutant materials in the air generated during the combustion of fossil fuels. Other significant impacts of the energy sector on the environment are the discharge of pollutants into the water and land, waste production and noise.

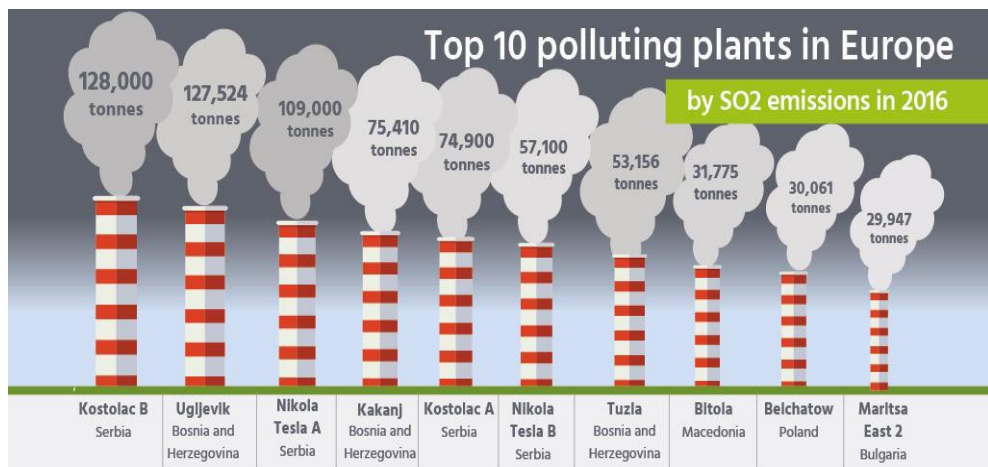


Fig. 2. Top ten polluting plants in Europe

Source: Health and Environment Alliance, 2019.

Figure 2. presents the top ten polluting plants in Europe. According to SO2 emissions in 2016, the second place is taken by the thermal power plant "Ugljevik" (the RS). "Ugljevik" power plant is a one-of-a-kind polluter. A relatively small plant (300 MW) emits unimaginable amounts of dangerous sulphur dioxide: 83.265,84 tonnes. [CEE Bankwatch network, 2019. p. 18]. This power plant has a problem with the installation of flue-gas desulphurization equipment, as well as the application of measures to reduce emissions of nitrogen oxides. Ugljevik's toxic

emissions caused 635 deaths, 1.689 cases of bronchitis in children and adults, 494 hospital admissions and 192.236 lost working days in 2016 only. [Health and Environment Alliance, 2019, p. 17]

On the other hand, from the ten largest thermal power plants in Europe (with an installed capacity of 2.250 – 4.928 MW), Polish Belchatów is the only power plant among the ten largest polluters in Europe. Nevertheless, by adopting the Green Deal, the EU has committed itself to shutting down thermal power plants and switching to renewable energy sources in total. The European Green Deal involves several different activities: transforming the transport industry, investing in renewable energy technologies, creating markets for clean technologies and products, reducing GHG gas emissions, renovating homes and buildings, restoring nature and enabling biodiversity etc. [European Commission, 2021]

Bearing in mind the share of energy from fossil fuels, the question for the RS is how to provide enough energy to future generations? Therefore, the development of the RES production in the RS is a critical challenge for policymakers nowadays.

1.1 Production of electricity from the RES in the RS in 2020

Directive 2009/28/EC on promoting the use of energy from renewable energy sources establishes a common legal framework and uniquely regulates the promotion of electricity from renewable energy sources and the promotion of biofuels or other renewable transport fuels. This Directive is also binding for the RS, i.e. B&H, since the Ministerial Council of the Energy Community in October 2012 decided to extend the mandatory legislation to this Directive. An integral part of the decision is the targets for the share of renewable energy sources in 2020 for all countries signatories to the Treaty establishing the Energy Community. That target is 48% for RS and 40% for B&H. [European Commission, 2009]

Adopting the Law on Renewable Energy Sources and efficient cogeneration created a legal framework for the final definition of the system of incentives for electricity production from renewable sources and in efficient cogeneration. The incentive system is based on the most important and most recognizable types of incentives:

- the right to mandatory purchase of produced electricity according to guaranteed purchase prices (feed-in tariffs - FIT) and
- the right to a premium for consumption for own needs or sale on the market of the RS (feed-in premiums). [Official Gazette of The RS, 2013]

In addition to these types of incentives, the following are also prescribed: benefits when connecting to the network, advantage in network access, the right to

Issue 4/2021

mandatory purchase in trial operation, handover of electricity according to the principle of net measurement. For a maximum duration of 15 years, the incentive can only be realized for plants with new equipment. The amount of encouraging electricity has been regulated, and the RS Action Plan set the quantity limits. Quantitative restrictions do not apply to incentives insight transmits on the principle of "net measurement".

The right to support electricity production from RES and efficient cogeneration in 2020, was granted to 142 production plants. Table 2 gives the fundamental production indicators of plants in the incentive system:

Table 2. Production of electricity from RES

| Power plants by technologies | Realized production | Calculated at the reference price | Calculated premium | TOTAL |
|------------------------------|---------------------|-----------------------------------|--------------------|-------------------|
| 2020 | (kWh) | (0.0029€/kWh) | € | € |
| Solar power plants | 9.913.986 | 291.834 | 1.003.073 | 1.294.908 |
| Hydropower plants | 214.509.087 | 6.241.945 | 7.654.971 | 13.896.916 |
| Biomass power plants | 1.292.533 | 151.744 | 490.639 | 642.384 |
| Biogas power plants | 10.751.183 | 199.254 | 640.408 | 839.661 |
| FEED-IN price (FIT) | 236.466.789 | 6.884.777 | 9.789.092 | 16.673.869 |
| Solar power plants | 1.717.150 | 0 | 103.904 | 103.904 |
| Biogas power plants | 330.768 | 0 | 24.152 | 24.152 |
| Premium | 2.047.918 | 0 | 128.056 | 128.056 |
| TOTAL | 238.514.707 | 6.884.777 | 9.917.148 | 16.801.925 |

Source: Regulatory Commission for Energy of the RS (2021)

The following graph showed the structure of energy production from RES in the RS in 2020. As we can see, the most significant share in production from RES is from hydro plants, even 91%.

The RS produced 7.308,05 GWh of electricity in 2020, but only 2.020,83 GWh come from the RES or just 27,65%. Production of electricity from RES in the RS depends on the hydrology and the operational readiness of all capacities. However, in the total gross consumption in 2020, electricity produced from RES amounted to

49,4%! Total electricity production realized in small hydropower plants in the incentive system amounts to 214.509 GWh, which is 58,1% of the planned annual production of these power plants in 2020.

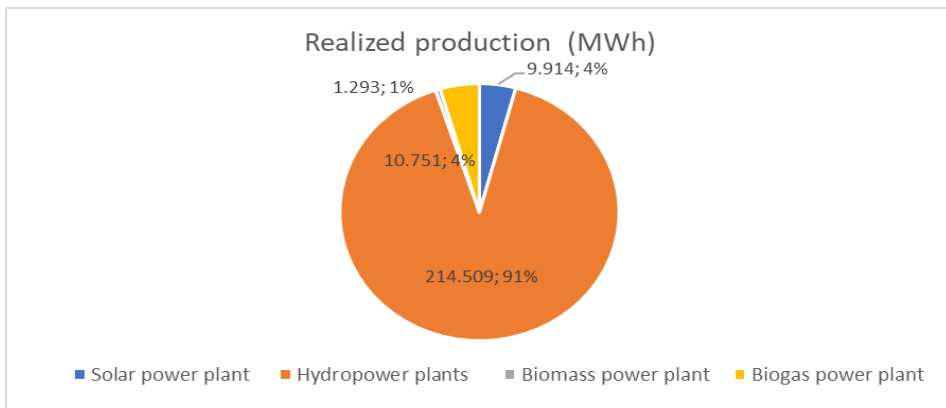


Fig. 3. Production of electricity from RES

Source: Author's calculation based on data from *Regulatory Commission for Energy of The RS (2020)*

The right to support the electricity production from RES and in efficient cogeneration (based on the contract on mandatory purchase of electricity) at the end of 2020 was granted to 97 solar plants, with a total installed capacity of 11,41 MW and planned 14,06 GWh annual production. In 2020, solar plants produced 11,67 GWh, which represents 83% of the planned annual production. Only three biomass/biogas plants, 2,12 MW of the installed power, produce 12,37 MWh or 12,15% more than planned annual production in 2020. [Regulatory Commission for Energy of the RS, 2021]

2. Production of electricity from the RES in the future

B&H has developed many documents dedicated to reducing GHG, among them, *National Emissions Reduction Planned in 2018* and, following the Paris agreement, *Nationally determined contribution of Bosnia and Herzegovina (NDC)* for the period 2020-2030. District heating, building, transport, industry, agriculture, forestry and waste are critical sectors for reducing GHG emission. [United Nations, 2015]

Issue 4/2021

The thermal power plant in B&H cannot meet EU standards. B&H plans to cut GHG emissions by 33,2% by 2030 and almost 66% by 2050, compared to 1990 levels. With the increase of GHG sinks in the forestry sector, the projected emissions by 2050 will be about 80% less than the net emissions in 1990. [United Nations Climate Change, 2021]

With this declaration, the country has also committed itself to introduce a model for the taxation of GHG gas emissions, an increase in the share of renewable energy sources, and the phasing out of coal subsidies. However, all the above-stated data and facts indicate that the RS will have a severe problem when facing taxes on energy produced from fossil fuels.

No doubt, the RS must increase the share of RES in total electricity production in the next decade. However, what is the potential of RS in the field of RES?

The RS is an area rich in hydro potential, with 3.200 MW technically exploitable hydro energy potential. According to the data stated in *the Energy Strategy of the Republic of Srpska, up to 2030*, RS could produce up to 9.500 GWh of electricity per year on average. However, only 2.420 GWh of this potential is used.

In the coming period, Power utility Elektroprivreda RS Trebinje plans to build four significant hydropower facilities with 340,03 MW installed capacity:

- HPP Dabar (installed capacity 159,15 MW, production 251,80 GWh/year),
- HPP Buk Bijela (installed capacity 93,52 MW, production 332,34 GWh/year),
- HPP Foča (installed capacity 44,15 MW, production 175,87 GWh/year) and
- HPP Paunci (installed capacity 43,21 MW, production 166,9 GWh/year). [10]

HPP Dabar is under construction, and other projects are in the phase of providing funds for investments and resolving property issues.

The south of the RS has 1,50 to 1,55 MWh/m² of total solar irradiation. On the other hand, solar radiation is not too low in the northern regions: 1,25 to 1,30 MWh/m². A study of the construction of the first large solar power plant near Trebinje, with an installed capacity of 100 MW and an average annual production of 147,7 GWh, is currently underway.

Wind energy has not been used for production of energy in the RS until now. It can be said, the south of the RS has significant potential for the production of energy. According to one-year wind measurements, the average annual wind speed is determined between 6,1–8,1 m/s. The theoretically exploitable potential for the use of wind energy is estimated at 640 MW and 1.200 GWh/year. A feasibility

study was prepared for the construction of WPP "Hrgud" with an installed capacity of 48 MW and an average annual production of about 126 GWh.

Some geothermal potentials have the northern part of the RS with the average temperature of geothermal waters in reservoirs around 100°C (80-150°C). Nowadays, these sources of hot weather are used primarily for balneological purposes.

Waste from the timber industry, firewood, municipal waste, cattle breeding and energy crops, pruning residues of perennial crops etc., could be a great source of energy in the RS. The theoretical potential of biomass in the RS is estimated at 31,08-46,24 PJ. 59% is biomass suitable for combustion, and 39% biomass is suitable for biogas production. No biomass/biogas power plant has been planned to be built nowadays by the government of the RS. There are only three small capacity biomass/biogas power plants in the private sector in the RS. [The Republic of Srpska Government, 2012]

Conclusion

Reducing greenhouse gas emissions by at least 55% by 2030 requires higher shares of renewable energy and greater energy efficiency in an integrated energy system. This transformation will improve our health and well-being, create jobs, generate investment and innovation, reduce energy poverty and dependency on energy imports and strengthen the security of supply.

Somebody said the amount of sunlight that strikes the earth's surface in an hour and a half is enough to handle the entire world's energy consumption for a full year. Solar energy is accessible everywhere. Wind and solar investment should be explicitly linked to closing coal plants. Only wind and solar give the full benefits of a coal phase-out in terms of jobs, investment, energy self-sufficiency, cheap energy, clean air, and reduced CO₂ emissions.

Although there is significant energy potential in RS, utilization depends on investment opportunities. Although sun and wind are recognized as the best energy source in the future, the technology of producing energy from the sun and wind is still expensive for the RS.

Whether RS will change from an electricity exporter to an importer depends on the policies and decisions made in the coming period. Installing the necessary equipment for desulphurization in thermal power plants will somewhat delay the inevitability of extinguishing pollutants. However, if we want to follow the EU directives and other documents that we are obliged to incorporate into domestic

Issue 4/2021

legislation, B&H (and the RS) will face coal out. In the future, sufficient amounts of solar and wind energy must be provided to replace energy from fossil fuels.

References

- [1] CEE Bankwatch network (2019) *Comply or close*. Available at: <https://bankwatch.org/wp-content/uploads/2019/12/comply-or-close.pdf>
- [2] European Commission (2021) *European Green deal*; Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
- [3] European Commission (2009) *Directive 2009/28/EC*; Available at: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=celex:32009L0028>
- [4] Government of the Republic of Srpska (2012) *Energy Strategy of the R. Srpska until 2030*. Available at: <https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mper/Documents/energy%20strategy%20of%20republic%20of%20srpska%20up%20to%20030.pdf>
- [5] Health and Environment Alliance (2019), *Chronic coal pollution - EU action on the Western Balkans will improve health and economies across Europe*. Available at: <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>
- [6] "Official gazette of the RS", No 39/13; 108/13; 79/18; 26/19.
- [7] Regulatory Commission for the energy of the RS (2021) *Regulatory report on the electricity market, natural gas, oil and oil derivatives in the RS for 2020*, Available at: https://reers.ba/wp-content/uploads/2021/07/Izvjestaj_RERS_2020_LAT_2_dio.pdf
- [8] United Nations (2015) *Paris agreement*, Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf
- [9] United Nations Climate Change (2021) *Nationally determined the contribution of Bosnia and Herzegovina (NDC) for the period 2020-2030* Available at: <https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=BIH>
- [10] <https://reers.ba/wp-content/uploads/2021/02/Tre%C4%87i-paket-EZ-2013.pdf>
- [11] <https://reers.ba/pravila-i-propisi/propisi-iz-oblasti-obnovljivih-izvora/>
- [12] <https://ers.ba/project-details/he-dabar-project/>
- [13] https://beyond-coal.eu/wp-content/uploads/2019/12/Solving_the_coal_puzzle.pdf