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SUSTAINABILITY OF ENERGY PRODUCTION FROM FOSSILS AND REVERSIBLE ENERGY IN KOSOVO

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Abstract: *Over the years Renewable Sources are the focus in terms of Energy. Renewable energy replaces traditional fuels in four different areas: electricity generation, water and space heating, motor fuels, and rural energy services. The development of the energy market and especially renewable energy is playing a key role in Kosovo, this can simultaneously lead to the stabilization of the new economy of the country. Only a sustainable, efficient and modern energy supply can ensure the rapid development of new industries. Energy production in Kosovo is currently supported by fossil fuels, mainly coal, while a small amount of energy is obtained from renewable sources. The use of fossil fuels has a major negative environmental impact, and this makes us think of a more sustainable solution with less impact on the environment. In this paper, based on the research method, it will be concluded how favorable is the use of wind energy in Kosovo, its economic and environmental impact.*

Keywords: *Renewable Resources, Wind Energy, Kosovo.*

Introduction

Fossil fuels are substances which, during combustion, release heat or other form of energy, formed by natural processes, such as the anaerobic decomposition of dead buried organisms, containing organic molecules originating from ancient photosynthesis that release energy into combustion. Fossil fuels contain high percentages of carbon and include oil, coal and natural gas. These are called fossil fuels and cannot be regenerated. Oil and natural gas meet 65% of total needs, coal 25%, RES 6% and nuclear energy 4%. The share of RES (including traditional biomass) in total world energy consumption was 18% in 2018. Compared to 2017, world energy consumption increased at a rate of 2.9%, almost double its average of 10- annual 1.5% per annum, and the fastest since 2010.

1. Electricity in Kosovo

The current situation of the electricity sector in Kosovo is still unsatisfactory. The availability and supply of electricity to consumers in recent years has improved but there are still daily reductions in electricity (at the level of distribution) which are pronounced during high consumption. Since 1984 there have been no constructions of new electricity generation capacities, except for some small hydro capacities, but which have not had an impact on solving the problem of security of electricity supply. Currently generating units: TPP Kosovo A is at the end of its technical life, while TPP Kosovo B needs a general revitalization to extend the life of the operation and to meet the obligations required by European directives on limiting pollutants.

Demand for electricity at the national level 6,001 GWh (including losses in transmission and distribution), most of which is covered by local production (generators), while the rest is covered by electricity imports.

The total operating capacity of generators in Kosovo is 1,099 MW, while the maximum load during this year was 1,253 MW, therefore the ratio of generation adequacy to maximum load is 87.7%.

2. Kosovo's capacity with RES

Renewable Energy Sources (RES) are an important component of the energy sector in Kosovo. Meeting the forecasts for energy production from RES is a long-term objective for achieving three goals of the country's energy policy such as:

1. Supporting general economic development.
2. Increase security of power supply and
3. Environmental protection.

Table 1. Incentive Tariffs (MED, 2011)

RES	(€/MWH)
HC (<10MW)	63.3
WIND	85.0
BIOMASS	71.3
POTOVOLTAIC	136.4

2.1 Wind energy

Winds in Kosovo are a common occurrence. The speed and direction of the winds depend on the direction and height of the mountains. There are more winds in the Kosovo Plain than in the Dukagjini Plain. In the Dukagjini Plain, the wind blows a little more in Gjakova, less in Prizren and Peja. In the Kosovo Plain, winds blow more in Mitrovica and Ferizaj, slightly less in Gjilan and Pristina. The maximum wind speed reaches 31 m / s and usually in March and April.

Table 2. Kosovo Capacity for Wind Utilization

Country	Capacities(MW)
Shtime 1	100
Shtime 2	27
KITKA	30
Golesh	1.36
Nëk Zatriq	30
Bajgore	50
Skenderaj	50
Totali	288.36

3.Kosovo's problem with electricity

One of the main priorities of our country's energy strategy for the years 2017-2026 is the fulfillment of targets and obligations in energy efficiency, renewable energy sources and environmental protection until 2020 and setting new targets further. Renewable Energy Sources (RES) are an important source of energy available to Kosovo, with a potential still underutilized.

As a member of the Energy Community, Kosovo is obliged to meet the mandatory targets for RES for 2020 set and approved by the Council of Ministers in 2012. For Kosovo is provided 25% of the share of RES in gross consumption of energy by 2020.

4. Utilization of wind energy in Kosovo

To get the most accurate data I have used the Global Atlas Wind site, which was created to help policymakers and investors identify potential wind farms for wind power generation almost anywhere in the world. data for the five regions of Kosovo. The figures below show the average speeds and power densities for these regions, for three base altitudes.

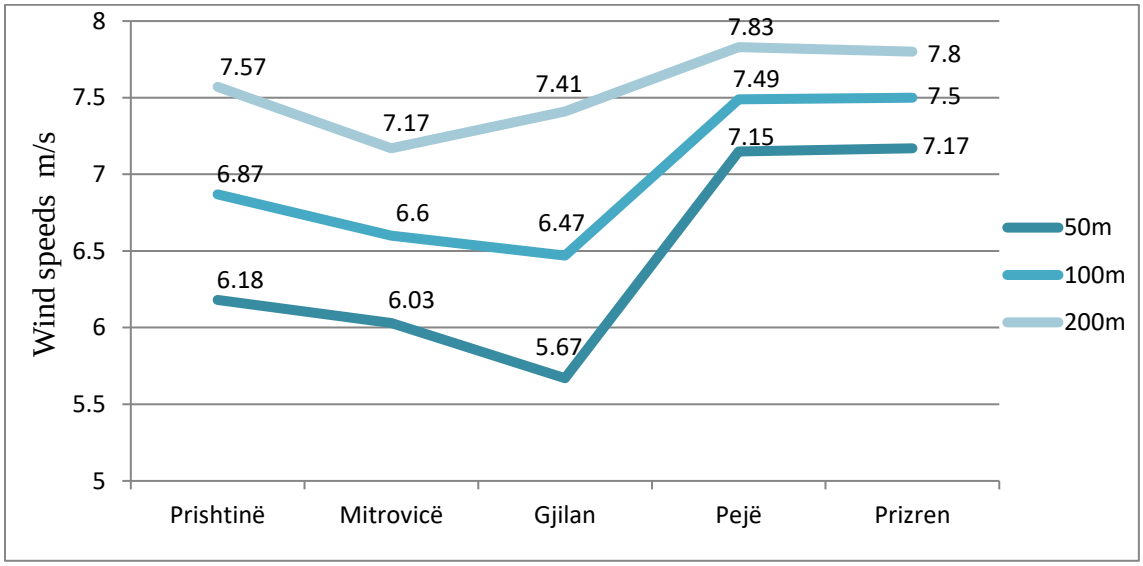

Fig.1. Average speeds of the five regions of Kosovo (https://globalwindatlas.info/, n.d.)

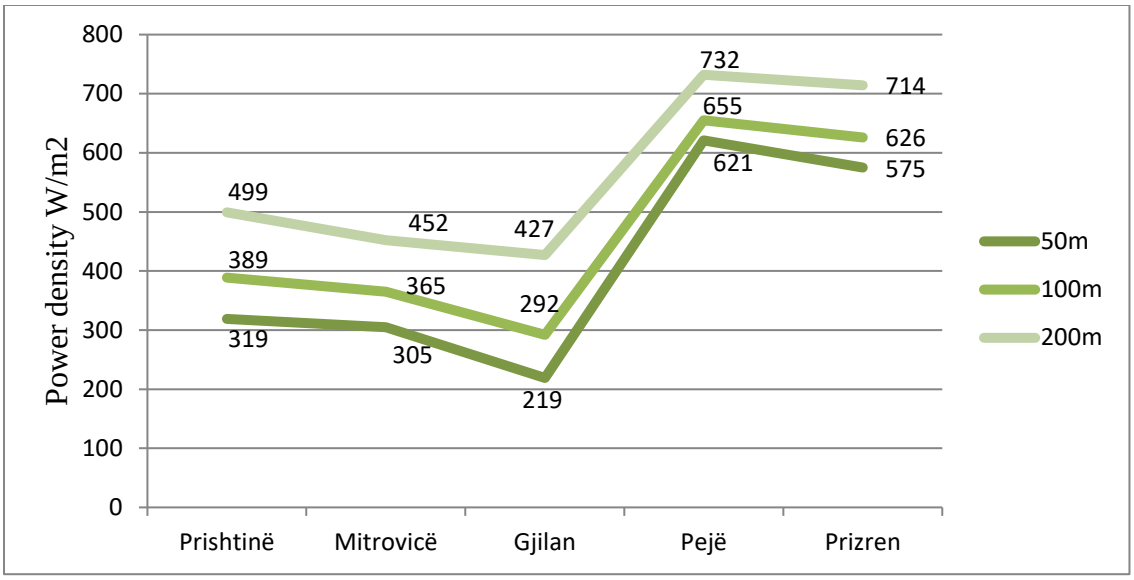

Fig.2. Power density for the five regions of Kosovo (https://globalwindatlas.info/, n.d.)

4.1 The most suitable locations for wind energy

Table 3. Locations and average annual wind speeds for altitude 50m (NEK UMWELTTECHNIK AG, 2012)

Name of the location according to the municipality	Geographical coordinates	Average annual speed for 50m
1. Podujevë	N43.06016, E21.06711	7.16 m/s
2. Mitrovicë	N42.97517, E21.01929	7.04 m/s
3. Prishtinë1	N42.70962, E21.37622	6.76 m/s
4. Prishtinë2	N42.65274, E21.39890	6.89 m/s
5. Therandë	N42.25303, E20.87857	7.06 m/s
6. Dragash	N42.14280, E20.69900	6.11 m/s
7. Gjakovë	N42.38261, E20.27494	7.54 m/s
8. Drenas	N42.63345, E20.78692	6.04 m/s
9. Zubin Potok	N42.85037, E20.62924	6.54 m/s

Table 4. Other data needed to determine the energy produced by the turbine (NEK UMWELTTECHNIK AG, 2012)

Name of the location according to the municipality	**Altitude**	**Air density depending on altitude**	**Coefficient of soil roughness α**	**Average wind speed per altitude 100m**	**Power density at altitude 100m above ground level**

1. Podujevë	1138m	1.096 kg/m^3	0.6m	7.75	550 W/m^2
2. Mitrovicë	1567m	1.048 kg/m^3	0.6m	7.52	489 W/m^2
3. Prishtinë1	994m	1.113 kg/m^3	0.5m	7.56	426 W/m^2
4. Prishtinë2	1143m	1.096 kg/m^3	0.3m	7.60	428 W/m^2
5. Therandë	1819m	1.021 kg/m^3	0.3m	7.27	548 W/m^2
6. Dragash	1148m	1.095 kg/m^3	0.6m	6.31	527W/m^2
7. Gjakovë	658m	1.152 kg/m^3	0.5m	7.67	666 W/m^2
8. Drenas	767m	1.139 kg/m^3	0.3m	6.62	364 W/m^2
9. Zubin Potok	1332m	1.1074 kg/m^3	0.5m	7.00	489 W/m^2

5. Recommendations

Kosovo, as a member of the EC has the task of reducing greenhouse gases through RES and EE. Wind energy has a key role in the future of energy in general, meeting energy requirements will also be achieved through the contribution of wind energy. Most of the participation of RES in BKFE is covered by biomass, this energy source is unsustainable for achieving the objectives of 2030. Therefore, to achieve the objectives, another distribution of capacities in other forms of RES is needed. The best option would be to increase the capacities in wind energy and solar energy.

Higher annual energy production, as well as the place with the highest capacity factor is the location: Podujevë with 5741.904 MWh and 32.8% (calculated with Weibull distribution), but also other locations like Prishtina, Mitrovica have high energy production. The calculation of energy cost and return on investment period is based on table 7. Thus the lowest energy cost has the location: Podujeva with 2.76 cents / kWh while the highest value has the location Dragash 4.90 cents / kWh, while the period of The lowest return on investment is given by the location Podujeva with 5.85 years.

The obtained results suggest one by one a greater development in terms of wind energy production, due to the small environmental impact and the fact that it is an inexhaustible source of energy.

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