

SOLAR ENERGY POTENTIALS

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ABSTRACT

In recent years solar energy has experienced phenomenal growth due to the technological improvements resulting in cost reductions and also governments policies supportive of renewable energy development and utilization. In this paper we will present possibilities for development and deployment of solar energy. We will use Kosovo to compare the existing power production potential and future possible potential by using solar energy.

Keywords: solar energy, renewable energy, development, deployment

1. INTRODUCTION

Electricity market in Kosovo consists of limited generation capacities – mainly TPP “Kosovo A and B”, transmission, and distribution and supply, which are regulated activities performed as public services. Responsibilities are shared amongst number stakeholders such as: independent regulatory body - Energy Regulatory Office (ERO), Electricity Market Operator (MO), Transmission System Operator (TSO) and Distribution System Operator (DSO), and the Ministry of Economic Development [1].

Renewable energy sources can be divided into several groups: solar power, wind energy, water currents, biomass energy, geothermal energy, gas, energy, environment. Given the continuous rise in prices of energy products, the popularity of using solar energy is increasingly growing. Since the lifetime of the solar system more than 20 years, is clearly the cost of initial investment in the installation of the solar system, not only financially, but also in environmental terms [2].

The renewable resources named also “green resources” are theoretically inexhaustible all over the world, free to use, and do not cause pollution. Since, they represent a great alternative to fossil fuel resources, some European countries, made the political choice to promote renewable energy and to supply electricity using a mix of traditional fossil fuels and “green resources” (such as wind, solar or biomass energy). Among these resources, wind is the cheapest on a large scale to transform into electrical energy. That is why much attention is paid nowadays to wind energy conversion systems. The use of renewable energies will continue to grow, and such plants will become cheaper and more readily accepted by the market [3].

2. GENERATION FORECAST

In July 2009, the Government of Kosovo articulated a five-pronged strategy to meet rising energy needs. This strategy is comprised of: (a) private sector investment in a new lignite-fired power

generation project, (b) privatization of the electricity distribution and supply business, (c) private sector participation in rehabilitation and environmental upgrade of the Kosovo B Power Station (derated capacity of about 560 MW), (d) decommissioning of the Kosovo A Power Station by 2017, and (e) development of renewable resources (including small hydropower plants, wind, solar, biomass). With TPP Kosovo A reaching the end of its useful life by 2017, the development of a new thermal power plant (New Kosova Power Plant) is proposed to begin between 2011/2012. The design for this plant is comprised of two units (G1 and G2) with installed capacity of 2x300 MW. The first of these units is expected to become operational in late 2016, and the second unit six months to a year later. The Ministry of Energy and Mining in Kosovo also estimates that a third new power plant (G3) with a capacity of 400 MW will be needed to meet growing electrical demand by 2018. In addition to the proposed New Kosova Power Plant, upgrades are planned to improve the capacity of TPP Kosovo B. It is anticipated that these units will be rehabilitated in 2016 – 2017, including investments required to meet the emission standards required by the European Union Directive for Large Combustion Power Plants. It's estimated that the placement of new rotors in both B1 and B2 will provide for a reduction of unused capacities to only 10 MW per unit, in reference with their nominal capacity [4]. The Ministry of Energy and Mining (MEM) has determined indicative targets of renewable energy resources to be integrated into the Kosovo power grid through the Governmental Program for Clean and Efficient Energy. They program has presented a base scenario which includes expanded hydro resources, wind, biomass and solar photovoltaics. This scenario is presented below as it pertains to Kosovo's energy strategy [4].

MEM 'base scenario' for renewable energy resources to be developed by 2020:

- The MEM base scenario foresees the development of a known accumulating hydro power plant project, HPP "Zhur", with an installed capacity of 305 MW. This project is expected to be operational by 2016. It is estimated that HPP Zhur could produce ~398 GWh per annum
- Development of an additional 20 'small' HPP is expected to contribute 140.3 MW by 2020.
- Three private wind developers have submitted project applications to KOSTT with a combined total capacity of 157 MW. MEM estimates that from these projects, 141 MW of wind energy capacity will be installed on the Kosovo grid by 2020.
- The development of biomass and urban waste fuelled power plants is envisaged to start in 2012, with progressive capacity development reaching 16.5MW by 2020.
- Estimates of the potential for installed solar photovoltaic (solar) capacity are low – primarily due to a perception of too-high capital costs. The MEM base scenario envisages only 0.8 MW of solar capacity on the Kosovo grid by 2020.

The MEM base scenario for new generation capacity is summarized in *Table 1* below.

Table 1. MEM Base Scenario for New Generation Capacity (2010 – 2020) [4]

	Unit	Installed Capacity	In operation
New TPP	G1	300	Q1 2016
	G2	300	Q1 2017
	G3	400	Q1 2018
New Renewable Energy Capacity	HPP Zhur	305	Q1 2016
	Small HPP	140.3	Q1 2010 – Q4 2020
	Wind	141	Q1 2010 – Q4 2020
	Biomass	16.5	Q1 2012 – Q4 2020
	Solar	0.8	Q1 2017 – Q4 2020

3. SOLAR RADIATION IN BALKAN REGION

The annual radiation on a solar collector panel directed towards south and with an optimum inclination of 35 degree (calculated optimum inclination) varies between 1550 kWh/m²/year and 1650 kWh/m²/year in Kosovo. This range can be seen on the solar map for the South East Europe in *Figure 1*. The variation between the various municipalities is less than 10%. For design purpose it can be considered that the solar radiation is the same all over Kosovo and equal to 1600 kWh/m²/year for an ideally located solar collector.

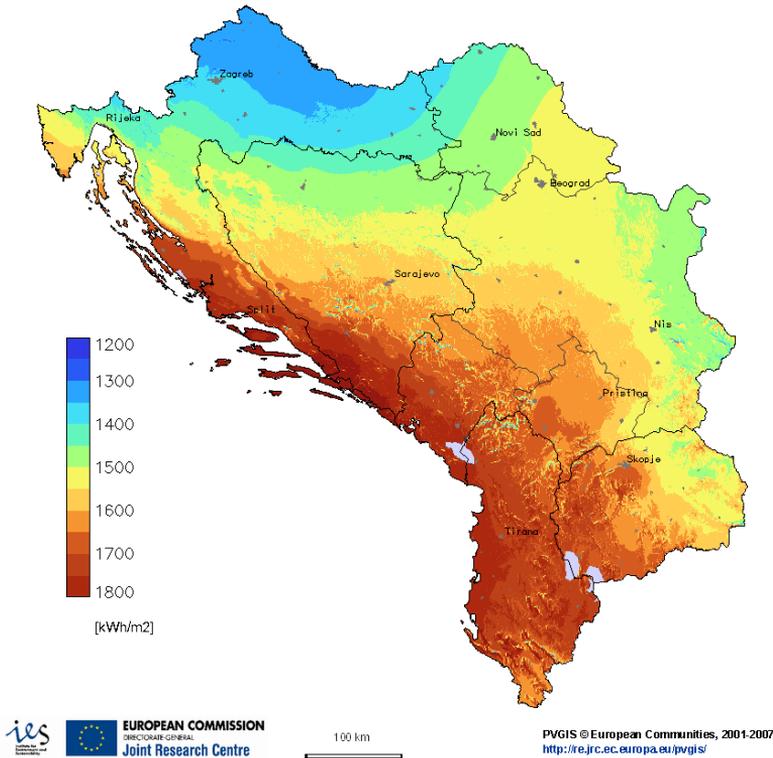


Figure 1. Solar radiation in Balkan region, optimum inclination and direction

4. SOLAR ENERGY PRODUCTION IN WORLD

In Table 2 we have presented countries with the most installed solar energy in MW.

Table 2. Countries with the most installed solar energy in MW [5]

No.	Countries with the most installed solar energy	MW
1.	Germany	9785
2.	Spain	3386
3.	Japan	2633
4.	US	1650
5.	Italy	1167
6.	Czech Republic	465
7.	Belgium	363
8.	China	305
9.	France	272
10.	India	120

We see from the table that the production of solar energy in the world compared to Kosovo production capacities is much higher.

5. CONCLUSION

Based on what is stated above we can conclude that Kosovo possess high potential of renewable energy (green resources). It can be considered that the solar radiation is the same all over Kosovo and equal to 1600 kWh/m²/year for an ideally located solar collector.

However, estimates of the potential for installed solar photovoltaic (solar) capacity are low – primarily due to a perception of too-high capital costs. The MEM base scenario envisages only 0.8 MW of solar capacity on the Kosovo grid by 2020.

6. REFERENCES

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