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# Possibilities of utilizing the potential of solar energy in Kosovo

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**Abstract.** Abstract. Solar energy aims to revolutionize energy production by harnessing the sun's sustainable power. Global concerns about climate change, energy security and the limited nature of fossil fuels continue to escalate, and we can rightly say that renewable energy sources have gained significant importance in Kosovo as well. Solar energy, in particular, is being targeted as a promising solution due to its practical and inexhaustible nature and environmentally friendly impact. Electricity production through photovoltaic (PV) systems is mainly intended to be connected to the grid in primary or secondary distribution because these small-scale producers cannot be connected to the grid directly. Through a comprehensive and interdisciplinary approach, the use of solar energy aims to set new standards in the implementation of renewable energy, utilizing the opportunities throughout the territory of the Republic of Kosovo. For sustainable development, this initiative has the potential to shape a cleaner, greener and safer future now and for generations to come. This paper proposes to set up a large-scale solar power facility in a sunny region, utilizing the latest photovoltaic technology to capture and convert solar radiation into clean electricity.

Keywords: Sustainable key production, storage and grid integration, photovoltaic system.

## INTRODUCTION

Today with more knowledge, people are however very concerned about the effects of conventional sources of energy production and are therefore giving special importance to the rapid depletion of conventional sources [1]. Renewable energy as an alternative is on the rise, to reduce the impact from fossil fuel reserves and improve the hitherto degraded environment. By effectively utilizing even a part of this abundant resource, Kosovo has the potential to meet energy needs by bypassing production from fossil energy sources. There are numerous methods for capturing solar energy, ranging from photovoltaic (PV) and thin-film solar cells to quantum dot cells, concentrated PVs, and solar thermal power stations [2]. These technologies offer practical advantages in terms of efficiency. However, it is important to note that even if solar energy could meet the entire global demand for electricity, we would need to find alternative sources for 80% of the energy consumed in the form of thermal energy (heat) so that even for thermal energy, fossil resources should not be used [4].

The potential to benefit from solar energy is huge. A total of 173,000 TW (trillion watts) of solar energy continuously falls on the earth's surface. More than 10,000 times the world's current total energy use [6].

## 1. THE POTENTIAL OF SOLAR ENERGY IN KOSOVO

The analysis of the potential of solar energy in Kosovo highlights some important findings that can create sustainability in the energy future of the country. If we take into account various factors such as geographical location, solar radiation levels, land availability and technological advances in the use of solar energy, the analysis of the potential of solar energy in Kosovo shows that our

country possesses a valuable and largely untapped resource for the production of electricity [8]. Taking into consideration the aforementioned factors, Kosovo can move towards cleaner and more diverse energy production from renewable sources. Embracing solar energy will not only contribute to preserving the environment and combating climate change, but will also bring economic benefits through job creation and reduced dependence on fossil fuel imports. To realize this potential, Kosovo must overcome challenges related to initial investment costs, regulatory frameworks and infrastructure development [8].

Implementation of support measures such as favorable energy policies, financial support and capacity building can accelerate the adoption of solar energy technologies. Collaboration between the government, the private sector and international partners will be vital in unlocking the full potential of solar energy in Kosovo. By embracing renewable energy and pursuing sustainable development, Kosovo can move towards sustainable development and make an important contribution to a greener future.

### 1.1 Solar radiation potential

Kosovo has significant solar energy potential due to its geographical location in a region with abundant solar radiation. Analyses show that the country receives a high level of solar radiation throughout the year, which makes it suitable for harnessing solar energy to meet electricity needs. Kosovo, being located in the Balkans, receives a significant amount of solar radiation throughout the year. The geographical position of the region has high solar energy potential, with an average of about 1,500-1,700 kWh/m<sup>2</sup> of solar radiation per year [8].

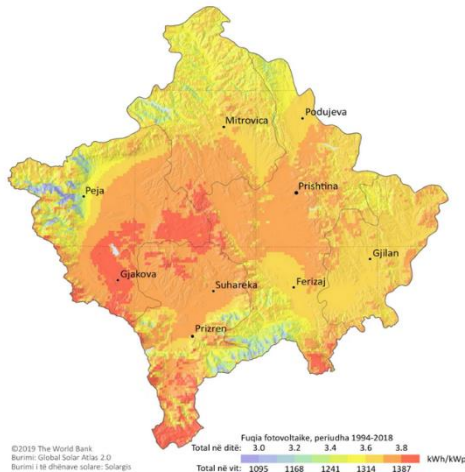


Fig.1 Geographical position of the Republic of Kosovo

### 1.2 Solar PV technology

Use the potential of solar energy will enable Kosovo to diversify its energy sources. Currently, the country relies heavily on fossil fuels for electricity generation, which contributes to greenhouse gas emissions and environmental degradation. Switching to solar energy will help reduce the country's carbon footprint and dependence on imported fossil fuels. Photovoltaic (PV) technology is the main means of harnessing solar energy. Solar panels can be installed on rooftops, on open ground, and even integrated into building designs to generate electricity [9].

### 1.3 Energy Independence

Kosovo relies heavily on imported fossil fuels to meet its energy needs. Solar energy can play an important role in reducing this dependence and increasing energy security by providing a renewable energy source even for household needs. The use of solar energy enables the creation of new jobs either in the production, installation or maintenance sectors, providing sustainable economic benefits. To maximize the use of solar energy, Kosovo will need to invest in grid infrastructure and energy storage technologies. These improvements will ensure a stable and

reliable supply of electricity, even during periods of low solar radiation or peak demand.

#### **1.4 Government initiatives**

The success of solar energy deployment in Kosovo would depend to a large extent on government policies, incentives and regulations. Support measures such as feed-in tariffs, tax incentives and net metering can encourage private investment in solar energy projects. The use of solar energy can have positive economic implications for Kosovo [8]. It can create new job opportunities in the renewable energy sector, stimulate local industries and attract foreign investment. Additionally, solar energy projects can provide a decentralized energy solution, reducing transmission and distribution losses. Developing a comprehensive energy policy that promotes solar energy and provides investment incentives is essential. This can include feed-in tariffs, tax benefits and streamlined permitting processes for solar projects.

#### **1.5 Integration of Photovoltaic Energy in the electricity network of Kosovo**

Of all the renewable energy sources in Kosovo, photovoltaic energy turns out to be the source with the highest utilization potential. Kosovo during a year has approximately 270 sunny days and the greatest energy potential is in the central part of Kosovo. PV grid integration is very important as it optimizes the construction of the energy balance, improves the economics of PV systems, reduces operating costs and provides added value to the consumer and the grid. This integration is already a practice in many countries of the world, because there is a growing demand for the use of renewable energy sources against fossil sources. Currently, advanced inverter equipment that converts PV direct current to alternating current for the grid can be used to help control voltage and make the grid more stable.

### **2. RESULTS FROM THE CASE STUDY**

As a case study we have taken: Construction of the Solar Energy Park, in the Kodra e Hutit cadastral area, Municipality of Gjakova. The construction of this park is in full compliance with the strategy of the Republic of Kosovo for the use of alternative energy sources, as Kosovo is in the process of harmonizing legislation with that of the EU in the field of climate protection as well as in the field of utilization efficient energy and the promotion of alternative energy. The Solar Energy Park will be built with the aim of producing electricity from solar energy, which process is carried out through solar cells (panels). In this park, the characteristics of the existing state of the park and the surrounding locality have been analyzed, as well as the characteristics of the relevant potentials, on the one hand, and other environmental characteristics of the works that take place in this park, on the other hand. Then the negative impacts on the environment and the application of measures to reduce the impacts during the construction phase and the performance of the production activities of the Solar Energy Park were taken as a basis.

#### **2.1 Geographical position and location description**

This Park is located in the locality of the Municipality of Gjakova, more precisely in the southeastern part of the Dukagjini plain. It covers an area of 586 km<sup>2</sup> and with an altitude of +365m, between latitude 42.22 and longitude 20.26.

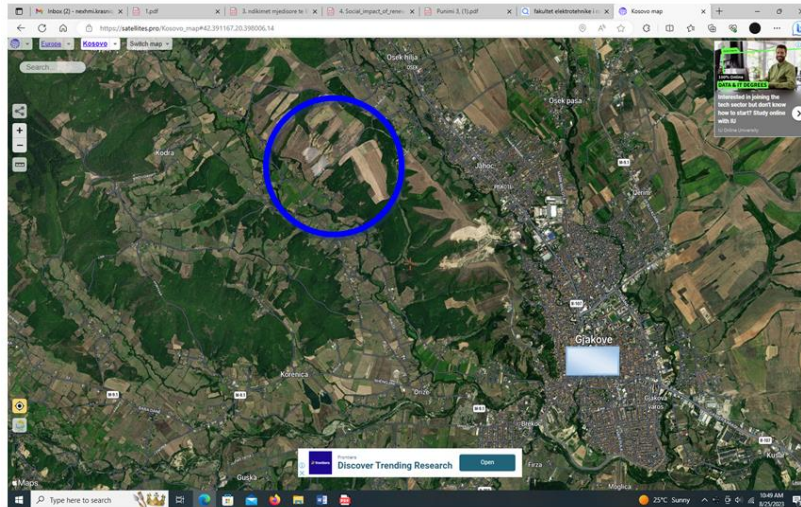
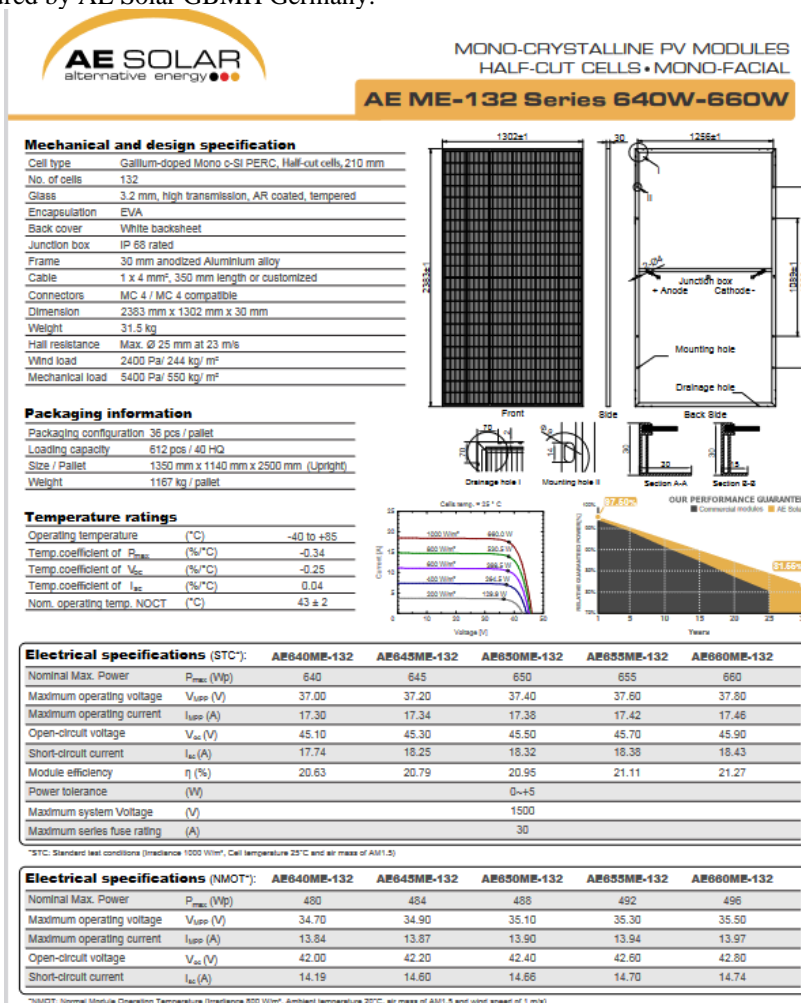


Fig.2 Location of the Municipality of Gjakova, borrowed from Google earth.

The construction of the Solar Energy Park with an installed capacity of 8 MW/h, it is planned to install 12126 monocrystalline solar modules (panels) (640 W – 660 W) AE ME-132 Series manufactured by AE Solar GBMH Germany.



The telecommunication system will be installed Solar-Log type which enables the management of breakdowns and the maintenance of the On-Line system connected to the Internet. All the equipment that will be used in this project are high quality products and the most advanced technology in the production of solar energy in Europe. In the following, the technical characteristics of the equipment for the Solar Energy Park (Solar Plant) will be given. Size - panel dimensions are 2383mm x 1302mm x 30mm.

## SUMMARY

Kosovo possesses considerable potential for solar energy with its favorable climate and abundant sunlight. The implementation of solar energy on a larger scale has the potential to increase energy security, reduce dependence on fossil fuels and mitigate environmental impacts. However, the successful adoption of solar energy will require proactive government policies, effective incentives and public incentives to attract the right investments. , solar energy can play a crucial role in Kosovo's transition towards a sustainable and greener energy future. Grid-connected photovoltaic systems have grown dramatically in recent years due to increased global interest in renewable energy sources and increased energy demand. As a consequence, new and modern control strategies must be implemented to improve the efficiency, reliability and sustainability of PV systems. The construction of the Solar Energy Park (Solar Power Plant) is in accordance with the plan and strategy of Energy in Kosovo. This project fulfills all requirements and certificates of origin of production as well as protects the environment as a whole. Realization of the project for the construction of the Solar Energy Park for the production of electricity from sunlight with a capacity of 8 MW. The realization of this project will positively affect the improvement of the human condition because it will affect the better supply of electricity and mitigation of unemployment. It is energy produced without emissions. There will be no change in the landscape of the site, except for the space where the solar panels will be placed. We consider that the project in question is not only environmentally friendly but also welcome.

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