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# ENERGY PORTAL emagazine

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## Dubravka Đedović Handanović

Minister of Mining and Energy,

## ON THE WAY TO THE ENERGY TRANSITION

## SOLAR POWER PLANT B2 NOVA SUN TO BE CONNECTED TO THE POWER GRID SOON

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LUXEN SOLAR

Tier 1 BloombergNEF

**Manager for Serbia and the region:**
Nada Ivanov Ilić
+381 61 68 58 696
nada.i@luxensolar.at
www.luxensolar.com
europe@luxensolar.at

# WORD OF THE EDITOR

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**Address:**
Bulevar Oslobođenja 103/3
11010 Belgrade

**e-mail of the editorial board:**
info@energetskiportal.rs

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Dear readers,

Another school year has drawn to a close, and the season of vacations and enjoying the summer has begun. We've been busy, too. In line with the season, we've prepared a new issue of the magazine dedicated to solar energy and essential renewable energy sources.

Solar energy has seen significant development in recent years, with the European Union alone recording a growth rate of over 40 per cent. Globally, countries have set an ambitious goal of tripling renewable energy capacity by 2030. Regarding Serbia, we have provided an overview of the registers that offer information about connected solar power plants and prosumers in our country.

We spoke with Dubravka Đedović Handanović, Serbia's Minister of Mining and Energy, about the energy transition, investments in renewable energy sources (RES), improving energy efficiency, and support for energy-vulnerable households.

Maribor is the second-largest city in Slovenia and the first in the region to apply all circular economy principles. The mayor, Aleksander Saša Arsenovič, discusses modern technologies, energy efficiency, climate change, sustainable development, and other topics.

We talked about the support of the European Bank for Reconstruction and Development (EBRD), the challenges of the energy transition, and plans with Milena Popović Martinelli, Climate Strategy Delivery Principal for the Western Balkans at the EBRD.

The Serbian Electricity Exchange (SEEPEX) has definitively positioned itself not only as a significant stakeholder in the green transition and further liberalization of the electricity market in Serbia but also as an important integrative factor in stock market operations in a broader regional and interregional context.

MT-KOMEX is always ready to take on new challenges when it comes to building solar power plants. After constructing a 50-kW power plant in the Žiča Monastery, they recently completed another solar project in one of Serbia's most important monasteries – Manasija.

Don't miss the intriguing stories we bring you in the People and Challenges section. These stories will pique your interest and provide further insights into the world of renewable energy and sustainable development.

If you haven't packed your bags yet, start doing so, and take the magazine with you while you enjoy the warm summer days ahead.

Nevena Đukić,
editor-in-chief

Photograph: courtesy of Nevena Đukić

# IN THIS ISSUE...





Photographs: (first row) MT-KOMEX; (second row) Siemens; (third row from top to bottom) Emilija Jovanović; Organela







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# ON THE WAY TO THE ENERGY TRANSITION

The Energy Community recognized the Republic of Serbia as a leader in energy reforms in the region in 2023. Key steps have been taken to improve the legislative framework and set strategic goals for the future of the energy sector, which will contribute to the acceleration of the green transition and enhance the security of energy supply. We spoke with Dubravka Đedović Handanović, Minister of Mining and Energy, about the energy transition, investments in renewable energy sources (RES), boosting energy efficiency, and support for energy-challenged households.

**Q: How is Serbia's energy transition developing? What are the next steps in reforming the energy sector?**

A: I believe that it will be best to talk about Serbia's progress in the green energy transition in the previous two years with the help of numbers. The number of prosumers has increased from 400 to 3,000, the capacities of wind farms will be increased by nearly 40 per cent by the year's end, and

> The second round of auctions for around 400 MW of new green energy will be launched at the end of this year, as soon as we assess that the market is ready and that there are mature projects that can compete for incentives, which is something we analyze daily

for the first time, we have exceeded 100 MW of solar capacity. We have a three-year auction plan for the allocation of market premiums, which provides for 1,300 MW, and we have already achieved 715 MW of electricity produced by wind farms and solar power plants (of which 425 are included in the incentive system). Every day, we work diligently to reduce consumption in the household sector, so in the space of just one year, around 10,000 households received state grants for boosting energy efficiency in their homes. If we look only at the results achieved through the Clean Energy Programme last year, energy savings were equaled to the production of the Niš heating plant, which is among the largest such plants in Serbia.

Our ambition is to improve the legislative framework further. This, in addition to amending the Energy Law, implies the adoption this year of already prepared strategic documents, such as the Integrated National Energy and Climate Plan and the Energy Development Strategy.

As a large investor, the state plays an active role in the energy transition process. Key investments in the energy transition that we are implementing in cooperation with the Electric Power Industry of Serbia (EPS) include the construction of self-balancing solar power plants with a capacity of 1 GW, the Kostolac wind



Photograph: Unsplash/Karsten Wurth

INECP's key goals include increasing the share of renewable energy sources in electricity production to 45 per cent, significantly boosting energy efficiency, and reducing greenhouse gas emissions by 40.3 per cent by 2030 compared to 1990

**DUBRAVKA ĐEDOVIĆ HANDANOVIĆ was born in Belgrade in 1978. She graduated in banking and finance from the Faculty of Economics in Belgrade and got her master's degree in finance and management from SDA Bocconi University in Milan and UCLA Anderson School of Management in Los Angeles. She published several scientific papers on public-private partnerships and project financing in cooperation with the University of Belgrade. She was a guest lecturer at the master's studies at University College London, as well as at the Faculty of Economics in Belgrade. Since October 2022, she has held the position of Minister of Mining and Energy.**

farm (66 MW) that will be included in the power grid next year, as well as the new reversible hydropower plants Bistrica and Đerdap 3. In late April, we commissioned a flue gas desulphurization plant in TENT A, the largest environmental project implemented in thermal power plants in Europe at the moment. We decided to conduct auctions and award market premiums as a key incentive for privately funded projects, which the EU also recognized as one of the key tools for increasing the share of renewable energy sources.

Our strategic documents say that we will consume more energy in the future, and we need stable energy sources when renewable energy, solar, and wind are unavailable. Therefore, we seriously and thoroughly considered using nuclear energy, which is the only type of energy that can generate electricity, while adhering to the zero $CO_2$ emission concept. If we know that we now get more than 60 per cent of our energy from coal, it is clear that we cannot replace that amount of energy overnight. On the other hand, there are many uncertainties regarding the basic capacities that meet the condition of carbon neutrality, and we are aware that projects involving gas are exposed to numerous risks, from geopolitical and the willingness of international institutions to finance them to a possible change in the treatment of this energy source in the EU taxonomy. That is why we started to consider the option of including Serbia in the group of countries that use nuclear energy to generate electricity.

The energy sector reform began with transforming the Electric Power Industry of Serbia (EPS), the largest company in our country, which supplies all citizens and the largest part of the business sector with electricity. This process, which we started amid the energy crisis, is very complex and implies several challenges, which I believe we have adequately solved so far. Our goal is to protect workers in the energy transition, especially miners, and to create better conditions for employees.

Photographs: (middle) Pixabay/Petar Ubiparip; (Đedović Handanović) Emilija Jovanović

**Q: Last year, we had the first auctions for allocating market premiums for renewable energy sources. How satisfied are you with these auctions, and when will the second round be announced?**

A: By adopting a three-year auction plan covering the period from 2023 to 2025, we will provide at least 1,300 MW of new energy capacities generated from RES through private investments, auctions, and market premiums. Last year, we conducted the first auction for the allocation of market premiums, the result of which were nine new power plants, the achieved price of electricity twice lower than the market price at that time, a new 715 MW of electricity (of which 425 MW is included the incentive system) and more than a billion euros of private investments to be spent on the development of wind farms and solar power plants. This clearly indicates that Serbia has created an excellent environment and regulatory framework for the development of RES. We expect around 115 MW of wind and solar energy from auctions to be included in the power grid by the year-end.

The second round of auctions for around 400 MW of new green energy will be launched at the end of this year, as soon as we assess that the market is ready and that there are mature projects that can compete for incentives, which is something we analyze daily. Through auctions, we plan to encourage investors to keep the produced green energy in Serbia, which our citizens and the business sector will use. We will pay special attention to promoting the construction of solar power plants, and we will work to achieve the best possible price through good competition.

**Q: The household energy renovation program is continuing this year, too. What is included in this program, and what awaits us by the year's end?**

A: We, in Serbia, consume three and a half times more energy compared to the European average, which is why we support individuals in their effort to improve energy efficiency in their households to achieve energy savings between 25 and 30 per cent, increase comfort and reduce

> The state made the most significant investments in the distribution grid in the last few decades, a total of around 440 million euros

the emission of harmful gases. We recently concluded contracts with 137 local governments, including municipalities from Kosovo and Metohija, to which we gave about two billion dinars for subsidies for about 12,000 households this year alone. Individuals will be able to apply for subsidies as early as June, as soon as the local governments launch relevant tenders, which, depending on the package of measures, can go up to 65 per cent of the total investment value for the replacement of doors, windows insulation, facades, roofs, inefficient boilers and installation of



Photographs: (top) MT-KOMEX; (middle) Unsplash/Vuk Burgić

solar panels and collectors. All these measures actively involve citizens in the energy transition process. So far, about 30,000 households have received state subsidies, while by the end of 2027, we will have rehabilitated more than 70,000 households across the country. In cooperation with the World Bank, we provided 50 million dollars for subsidies to citizens.

**Q: The household energy rehabilitation program has given special attention to financially vulnerable households. How is the project implementation going?**

A: For now, those customers who are at risk can apply for subsidies in 44 towns. They are significantly higher than the other subsidies for citizens and amount to up to 90 per cent of the energy rehabilitation value. Thanks to minimal investments, energy-challenged customers will improve the comfort of their homes and significantly reduce their electricity bills. Translated into money, if the household changes doors and windows alone, for which a subsidy amount of, for example, 100,000 dinars is allocated, then the household is obligated to provide 10,000 dinars. We are dedicated to supporting the most vulnerable citizens, so this project is an excellent opportunity to remind all interested parties that they can apply to their local governments throughout the year to obtain this status.

**Q: Households are still eligible for discounts on their electricity bills. How significant is this kind of saving?**

A: During the winter, people showed great responsibility for the consumption of electricity in their households, which was very important for the stability of the energy system and also for their budget. The highest efficiency in electricity consumption was achieved in March. 1.8 million or 54 per cent of households were given the discount for rational consumption. 25 per cent of households, i.e., more than 830,000 households, were given the largest discount of 40 per cent by EPS. In the six months that the discount campaign lasted, electricity bills were reduced by 9.25 billion dinars, which is a significant contribution by EPS. I want to thank the citizens for recognizing the importance of fostering a rational attitude towards electricity consumption and inviting them to continue with small life changes that do not affect the quality of life but significantly contribute to the household budget and our energy system.

**Q: There are more and more renewable energy sources in our green mix, and new green megawatts are planned. How well is our distribution and transmission grid able to support new RES?**

A: Increasing the capacity for balancing wind and solar energy and developing the transmission and distribu-

Photograph: (bottom) Emilija Jovanović


state made the largest investments in the distribution grid in the last few decades, a total of around 440 million euros, which will reduce grid losses and increase supply security and reliability. By replacing substations and modernizing the grid itself, we will reduce the number of power outages, especially in remote parts of the country. Since October last year, more than 240,000 smart electricity meters have been installed, which will also positively contribute to reducing losses in the grid and provide a better service for consumers. 34,000 concrete power poles have been installed instead of wooden ones, as well as 723 transformers and 16 new substations throughout Serbia. Investments in the distribution grid are also crucial because of the citizen participation in the green transition. In two years, the

tion grid are prerequisites for using new capacities from renewable energy sources. This shows the important role of public investments and their complementarity with private sector investments. The key progress in this regard will be achieved by the construction of the new Bistrica hydroelectric power plant, with a capacity of 646 MW and an estimated value of around 1 billion euros. We plan to complete the work on the technical documentation by the year-end so that the preparations can begin next year.

The Đerdap 3 power plant project will have the same role as Bistrica, only with even greater capacity. The Serbian government has declared Đerdap 3 a project of national importance, and the drafting of the Preliminary Feasibility Study and the main project is underway.

Another prerequisite for integrating large capacities generated from RES is investments in the transmission and distribution grid. The electricity distribution grid is the bloodstream of the energy system, on which the safety and quality of electricity supply to citizens rely. The



Photographs: (top) Emilija Jovanović; (bottom) Unsplash/Milica Spasojević

number of producers has increased seven and a half times, so today, we have about 3,100 solar power plants with a total capacity of more than 50 MW included in the grid.

In terms of the transmission system, the main goal is to achieve the greatest possible flexibility of the system by increasing the interconnection capacities by approximately 75 per cent. Once the construction of the Trans-Balkan Corridor is completed, the transmission system of Serbia will be better connected with the transmission systems of Romania, Bosnia and Herzegovina, Montenegro, and Italy, which will position Serbia as an indispensable corridor for electricity transmission in Southeastern Europe. New projects such as the Pannonian Corridor and the Central Balkan Corridor are also planned to improve the transmission grid in Serbia and facilitate better connectivity in the region. We are also planning the implementation of the BeoGrid project, which is important because of the integration of RES from existing and new wind farms in the area of South Banat, as well as the future Kostolac B3 thermal power plant, the increase of transmission capacities on the border of Serbia and Romania and better security of energy supply in the Belgrade region.

**Q: What does the Republic of Serbia's 2030–2050 Draft Integrated Energy and Climate Plan (INECP) imply?**

A: Together with the new Energy Development Strategy, which should soon be put up for public discussion, the Integrated Plan represents a roadmap for the modernization of our energy sector and the implementation of the energy transition. A lot of effort was invested in drafting this plan for two and a half years, during which there were many challenges and changes in the energy sector, especially in Europe. We tried to set ambitious but achievable goals in the document and properly assess the impact of the planned measures and the dynamics of their implementation on the state, the business sector, and households. INECP's key goals include increasing the share of renewable energy sources in electricity production to 45 per cent, significantly boosting energy efficiency, and reducing greenhouse gas emissions by 40.3 per cent by 2030 compared to 1990. Achieving these goals implies, among other things, the construction of new production capacities, including solar and wind power plants with a total capacity of 3.5 GW, a new gas power plant with a 350 MW capacity, an increase in the use of heat pumps and higher number of electric vehicles.

It is important to underline that no country that has relied on coal for decades, not even Serbia, can change its energy mix overnight. Furthermore, although we strive for the same goals as the EU countries, the fact is that we do not have equal starting positions either in terms of energy or finances. It is very important for decarbonization and a successful green transition that, like the EU Member States, we have strong and continuous support from international partners and financial institutions to implement this process in a financially sustainable and socially just way. By adopting an ambitious but realistic plan for the energy transition, Serbia shows its readiness to work on increasing the security and independence of the energy supply and fulfill its international obligations regarding the implementation of the global climate agenda.

Interview by Milica Radičević

# SOLAR POWER PLANT B2 NOVA SUN TO BE CONNECTED TO THE POWER GRID SOON

The development of solar energy in Europe and around the globe continues to achieve excellent results. In fact, it holds a leading position among all renewable energy sources. MT-KOMEX recognized the potential for success in harnessing solar energy at a time when this energy was not widely discussed in our country. The dedication and persistence that have existed from the beginning to this day have led to the moment where MT-KOMEX is honored and deservedly recognized as a pioneer in the field of solar energy in Serbia.

Following this trend, MT-KOMEX has been entrusted with the construction of yet another solar power



Photographs: MT-KOMEX

plant in our country. The B2 Nova Sun solar power plant, with an installed capacity of 9.9 MW, will soon become operational in the Nova Crnja municipality.

The constructed solar power plant spans approximately 13 hectares in this part of Vojvodina and includes around 17,000 bifacial solar panels produced by Canadian Solar. Consistent in working with the highest quality equipment on the market, 100 Fronius Tauro ECO-100-3-P inverters, each with a capacity of 100 kW, were chosen for this project.

The Turkish manufacturer Kiraç Metal was selected as the supplier for the ground-mounted structure. It is important to note that a special structure was used for the bifacial panels to maximize the potential of solar energy. Bifacial panels can generate energy from both sides of the panel, producing a greater amount of electricity. The solar power plant will have nine dry transformers that are environmentally friendly.

Bojan Jovanović, a young electrical engineer and the manager of this project, says that building the B2 Nova Sun solar power plant was a significant challenge but also a great pleasure, as he was entrusted with such a project.

According to him, the entire solar power plant is situated on four plots that are physically separated from each other, which required finding the most efficient way to connect these parts to function as a single unit.

The B2 Nova Sun solar power plant is being built in the industrial area of Nova Crnja. The bifacial solar panels are installed right next to the former sugar production factory.

This investment complements the Municipal Plan for the promotion of renewable energy sources.

The expected annual electricity production from the B2 Nova Sun solar power plant is 14 MWh. Since all the produced electricity will be fed into the electrical distribution system, the residents of this part of Serbia will soon be supplied with clean energy. More specifically, the electricity generated will supply the settlements of Nova Crnja and the neighboring areas of Srpska Crnja and Vojvoda Stepa. Additionally, any surplus electricity will be further distributed to power the city of Kikinda.

Developing renewable energy sources not only boosts energy security but also reduces pollution. Once operational, this solar power plant will save 11,300 tons of carbon dioxide annually, resulting in cleaner and better-quality air in the area.

Prepared by Katarina Vuinac

### ELECTRIC VEHICLE CHARGER

In addition to households, the B2 Nova Sun solar power plant will also supply clean electricity to electric cars. An electric vehicle charger will be installed within the solar power plant, which is significant for the northeastern part of Banat County as it will be the first charger in this area. This 60 kW DC charger with two CCS connectors will be available on the Charge&GO platform.

The B2 Nova Sun solar power plant is being built in the industrial area of Nova Crnja

# MARIBOR – CIRCULAR ECONOMY IMPLEMENTATION HUB

The Maribor municipality adopted the Local Energy and Climate Concept, which states that we will be climate-neutral by 2040

Back in the day, Maribor was one of the most developed cities in Yugoslavia. Today, it is the second largest city in Slovenia and the first in the region to apply the circular economy principles. Following the adoption of the Strategy for Maribor's transition to a circular economy and the Action Plan that accompanies the Strategy, this idyllic tourist town defined the key development projects regarding the transition to the circular economy. Maribor also participates in the EU Pilot project for the bio-circular economy region of Podravje and is preparing an action plan and projects to be implemented by year-end.

In an interview for Energy Portal Magazine, Maribor's mayor, Aleksander Saša Arsenovič, discusses modern technologies, energy efficiency, climate change, sustainable development, and other current topics.

**Q: What modern technological solutions do you use for the treatment of mixed municipal waste? Did waste incinerators in Maribor become operational?**

A: The Snaga public company, which operates under the Maribor Public Holding Group (JHMB), provides municipal waste management services. Mixed municipal waste is collected door-to-door. The exception is the collection of waste in the town centre, where there are four underground collection points for mixed municipal and other types of separately collected waste. Struja sorts the collected mixed municipal waste into different fractions in a modern, well-equipped, organized sorting plant. Out of 75,000 tons of municipal waste collected annually, 32 per cent is collected at the source as mixed municipal waste, and 68 per cent is collected separately, all of which goes to purchasers for further processing and recycling. A waste incinerator has not yet been

Photograph: Vid Ponikvar

> For as many people as possible to change their travel habits in the future and use a bicycle instead of a car, the challenge is to harmonize or integrate all alternative ways of travelling into one standard system that would be connected to the information and tariff level

installed in Maribor. We are currently in the process of finding a location for the incinerator while also preparing amendments to the waste incineration regulation.

**Q: Are you developing the public-private partnership concept for implementing innovations? How many investments do such environmental protection projects attract?**

A: Energy renovation projects of public buildings are implemented in line with the public-private partnership model. In 2019, the Maribor municipal authorities fully renovated 14 and partially renovated 10 public buildings under a public-private partnership based on the energy contracting model. The municipality received cohesion grants for the comprehensive renovation. Thus, in 2019, the municipal authorities carried out the largest energy renovation in the region, with 24 public buildings (schools, kindergartens, sports halls) being renovated.

**ALEKSANDER SAŠA ARSENOVIČ was born on November 3, 1966 in Maribor. He is a lawyer by profession but began his career as a tennis player and a tennis school owner on Lake Constance in Germany. Thanks to his tennis school, he was engaged in developing sports tourism in Germany in the 1990s. Mr Arsenovič used his extensive experience in the catering industry to develop Maribor and its tourist offer.**

Photographs: (bottom) MP Produkcija; (Arsenovič) courtesy of Aleksander Saša Arsenovič

In 2019, the Maribor municipal authorities fully renovated 14 and partially renovated 10 public buildings under a public-private partnership based on the energy contracting model

The project value was 12 million euros. Annual energy consumption was reduced by 5,952 MWh, energy costs by 446,000 euros, maintenance costs by 28,500 euros and $CO_2$ emissions by 1,305 tons. Working and living conditions have improved significantly, and the users are delighted. The project is regularly monitored, and savings are verified by the Energy and Climate Agency of Podravje – ENERGAP, which also participated in preparing the relevant documentation, obtaining cohesion funds and monitoring the investment implementation.

**Q: How much have you done to improve household energy efficiency so far?**
A: Together with the municipal authorities, ENERGAP offers citizens energy consultations throughout the year. While providing these consulting services, ENERGAP actively cooperates with energy consultants who work with the ENSVET national network (network of energy consulting offices).



Photographs: (top) Marko Petrej; (bottom) MP Produkcija

At an ENSVET office, people receive free advice and information on investments in energy efficiency and renewable energy sources. They may also be able to obtain non-refundable financial incentives and favorable loans. All the necessary information and notifications about free energy consultations are available on the ENERGAP website and social networks.

From time to time, they publish tips on saving electricity and heat, information on the carbon footprint and how to reduce it, tenders for grants, tips on cooling rooms in the summer months, and tips on staying safe in the sun. Various online lectures and seminars for citizens are also organized on the topics of savings, heating, self-sustainability, energy renovation, construction, investments in renewable energy sources, etc. ENERGAP also has an advisory office on its premises to promote using renewable energy sources, which is intended for all interested citizens, municipalities, and companies.

**Q: What do you do to improve air quality, increase the use of renewable energy sources and work to develop mobility?**

A: Air pollution in Maribor has been decreasing year-on-year. The largest pollution, especially during the heating season, comes from using very old and inefficient appliances. The values of pollutants, especially PM10 particles, have dropped significantly in the last six years. In 2018, at the Krekovo/Tirševa measuring point, there were as many as 21 days where the daily pollution limit was exceeded, and in 2023, not a single such day was recorded at the same measuring point. All reports with ambient air quality and condition monitoring at all measuring points are publicly available on the environmental website and a unique Interactive Map. Regarding renewable energy sources, we plan to install eight solar power plants (total power of 1 MW) that will create a local, energy-independent community. We are also planning new solar power plants on 14 public buildings with a power of 2 MW. Additional power plants are scheduled for the closed Porežje and Dogoše landfills, and discussions are ongoing for constructing a 5MW solar power plant at the railway trisection.

**Q: Could you tell us about your activities for raising awareness about climate change and sustainable development?**

A: The Maribor municipality adopted the Local Energy and Climate Concept, which states that we will be climate-neutral by 2040. For this purpose, a road map of climate neutrality is currently being prepared, including the key steps the city must take. One of the essential activities is writing a study on the possibility of using hydrogen as a substitute for natural gas. A working group was established with numerous interested parties – Ministry of Environment, Climate and Energy (MOPE), IJS, UNIMB, Energetika Maribor, Plinarna Maribor and other expert institutions that already have experience and know-how in the

Photograph: Marko Petrej

field of hydrogen. This group will prepare a portfolio of potential hydrogen projects in the region. The municipal authorities also joined the initiative to adapt the EU mission. A study of the region's vulnerability and adaptability to climate change is being implemented. Under the auspices of the EU Climatefit project, Maribor participates as a city that implements a pilot project during which financial mechanisms for implementing climate change measures will be studied. The city is also actively devising starting points for establishing energy cooperatives, which will also help the public sector with decarbonization or neutrality. As part of these activities, the municipality cooperates with ENERGAP, which carries out informative and educational activities.

**Q: What will the electrification of public transportation look like?**

## NATURAL ISLAND ON THE DRAVA

Maribor Island, a natural island on the Drava River, has an area of special-purpose forests. These forests are vital for the city due to their unique location and contribution to the quality of life here. They provide a healthy environment and recreation area, are a natural and cultural heritage treasure, and facilitate close contact with nature.

State and local regulations protect Maribor Island in terms of nature, water, and forest protection. Over 330 plant species are on the island, 10 per cent of all Slovenian species. About 70 species of birds have been recorded here, too, and there is also a large number of mushroom species.

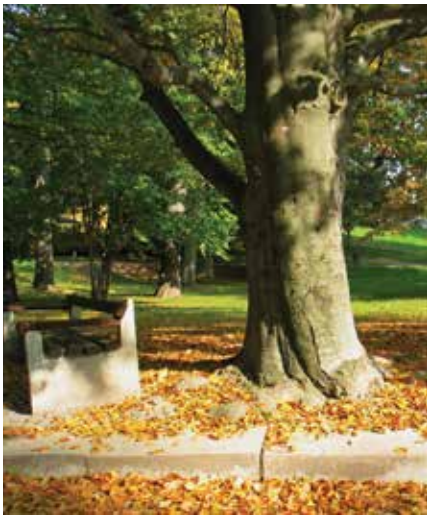
Photographs: Marko Petrej

A: In order, for as many people as possible to change their travel habits in the future and use a bicycle instead of a car, the challenge is to harmonize or integrate all alternative ways of travelling into one common system that would be connected at the information and tariff level. We have decided to change the route of bus traffic, and with that, we are also introducing certain green innovations in line with our transport strategy. After we carry out these changes, the city's public transportation grid will be physically and operationally well-integrated and connected to the regional and national systems. Passengers will switch from cars to public transport thanks to a series of measures. A public passenger, traffic development strategy, has been drafted, and thanks to the relevant project, we will get new high-frequency lines, fewer tracks and directly connected main aggregates. We have a total of 11 electric buses. The vision is to electrify half of the bus fleet by 2030. The main goal is to renew our public transport lines completely.


## INTEGRATED MOBILITY SYSTEM

Establishing an integrated mobility system is also called Mobility as a Service (MAAS). It entails all forms of transport (walking, cycling, public passenger transport at municipal and national levels, renting or sharing cars and/or bicycles) to simplify the use of alternative forms of mobility so that people no longer need to use their own cars. Good quality infrastructure for walking, cycling and competitive public passenger transport is a prerequisite for the successful functioning of Mobility as a Service.

"Regarding improving mobility, we are establishing and expanding the public bicycle rental system, changing bus routes, expanding the white zone areas and the area for cyclists and pedestrians, as well as introducing common traffic areas and expanding the network of public electric vehicle charging stations and e-buses", Mr Arsenovič adds.



The bike rental system – Mbike – is also an essential municipal project that is developing rapidly, as there are an increasing number of bicycle rental stations.

The Maister is an electric mini-vehicle that has been used in Maribor since December 2017 in the pedestrian zone and the city centre. Its use is free of charge. The municipality also has several public electric car chargers. We want to make charging and parking easier for electric vehicle owners and, in this way, raise public awareness.

Interview by Mirjana Vujadinović Tomevski

Photographs: (top right) MP Produkcija; (middle) Marko Petrej

# SOLAR ENERGY IN SERBIA AND THE COUNTRIES OF THE REGION

Solar energy has recorded significant development in recent years, with a 40 per cent growth rate in the European Union alone. Globally speaking, countries that participated in last year's United Nations Conference on Climate Change (COP28) set an ambitious goal of tripling renewable energy capacity by 2030. Considering this, the results of the Renewable Energy Sources 2023 annual report published by the International Energy Agency (IEA) should be mentioned. The importance of solar energy for achieving this goal is validated by the fact that solar capacities make up three-quarters of the total renewable energy capacities.

Globally speaking, countries that took part in last year's United Nations Conference on Climate Change (COP28) set an ambitious goal of tripling renewable energy capacity by 2030

In the Republic of Serbia, the Electric Power Distribution of Serbia's official website contains registers that provide insight into information about connected solar power plants and consumers in our country.

The register of connected power plants that use renewable energy sources (updated on May 15) shows that 375 such power plants have a total installed capacity of 254,936.09 kW. Of that number, over 160 are solar power plants. 814 are operated by prosumers who are not households or residential communities, and their total installed power



Photograph: Pixabay/Fabersam

the past year and a half. Currently, the total installed power of RES power plants operated by prosumers is about 52 MW and many requests for new connections to the power grid are being processed. On May 21, 2024, there were 1,588 requests from industrial prosumers for connection to the grid, i.e. 415.6 MW of solar capacity, and 437 requests from households and four residential communities. Regarding solar power plants, the Ministry of Mining and Energy announced on May 28, 2024, that in that month alone, the total capacity on the grid exceeded 100 MW for the first time.

## Regional countries

BOSNIA AND HERZEGOVINA – Available data indicate that 1,671 electricity production facilities have been set up. The registry of the Energy Regulatory Commission shows that in the Federation of Bosnia and Herzegovina, electricity production from solar power plants is done in 1,082 production facilities with a total installed capacity of 128,451 MW and an expected annual production of 231,517.66 MWh. According to is 33,558.23 kW. These are registered in the Prosumer Registry (updated on May 24). Regarding the Prosumer Registry, where prosumers are residential communities (updated on February 7), three residential communities operate RES plants, which have a total installed power of 69.5 kW. Finally, the Prosumer Registry of households (updated on May 24) consists of 2,278 households that operate RES plants with a total installed power of 18,489.16 kW.

The same website shows that the number of electricity prosumers has increased by about seven times in

### FIRST SOLAR CELL

The first practical silicon solar cell was developed in 1954 at Bell Laboratories in the United States. Although the invention of solar cells dates back to the 1830s, they were largely inefficient, i.e. unable to produce a significant amount of energy. However, in 1954, an important step in solar energy technology was made. Scientists used a semi-conducting material – silicon, whose efficiency of converting sunlight into electricity was about 6 per cent, a significant improvement at the time. For several years, they were used to power smaller devices and satellites.

Photograph: Unsplash/Erik Karits

## DIGITAL AGRISOLAR MAP

SolarPower Europe recently presented a digital map featuring agrisolar plants with a combined capacity of more than 2.8 GW. This map is the first of its kind, and it shows over 200 agrisolar projects in 10 European countries – Switzerland, France, the Netherlands, Lithuania, Germany, Spain, Belgium, Italy, Austria and Great Britain. These are solar projects integrated into agricultural activities, whether installed on the roofs of agricultural buildings or, for instance, solar panels integrated into irrigation systems and agrivoltaics. A large number of projects that are included in the digital map include initiatives for the protection of biodiversity and ecosystems.

the available data provided by the relevant power distribution operators, 589 small solar power plants are connected to the power grid in the Republic of Srpska. Of this number, 47 are prosumers, and the total power of these facilities is about 102 MW.

MONTENEGRO – At the moment, over 4,200 consumers in Montenegro operate 43,500 KWp or 43.5 MW of installed power worth of photovoltaic panels on the roofs of households and commercial buildings.

CROATIA – According to the data collated by OIE Croatia, in 2023, the country's power grid received a new 238.7 MW of electricity, reaching 462.5 MW on January 1, 2024. Solar capacity has grown the most among all power-generating technologies over the past year. If this trend continues, the expectation is that by January 1, 2025, the total capacity could reach 963 MW.

NORTH MACEDONIA – In April this year, the Energy Agency of the Republic of North Macedonia updated its RES Power Plants Registry. According to the available data, North Macedonia has 427 solar plants, with a total installed capacity of 150.82 MW and a planned annual production of 190,006 MWh.

SLOVENIA – In 2023, Slovenia installed more than 400 MW worth of solar power plants, which led to the fact that at the end of the year, the total installed power of solar power plants was 1101.5 MW, exceeding



Photographs: (top) MT-KOMEX; (middle) Pixabay/Roy Buri

1 GW. According to the Slovenian government's official website, Slovenia stood out as one of the leading countries in the EU in terms of the installed capacity of solar power plants per capita. Following the revision of the National Energy and Climate Plan (NECPs), around 3,500 MW of installed solar power plants are foreseen by 2030.

HUNGARY – Hungary's Ministry of Energy said that in late 2023, the number of smaller solar systems, mainly used in households or on smaller buildings, increased to over 255,000. Last year saw the most significant increase in the number of solar power plants under 50 kW, by 85,000. In one year, the total installed power of such power plants increased from less than 1,500 MW to more than 2,300 MW. The total solar capacity in Hungary at the time of reporting on January 21, 2024, was more than 5,600 MW. The revision of the National Energy and Climate Plan (NECPs) for 2030 increased the target from 6.5 GW to 12 GW.

ROMANIA – In 2023, Romania installed over 1 GW worth of new solar power plants, resulting in a total capacity of 2.85 GW, according to a SolarPower Europe report. More precisely, the number of consumers, households, companies and institutions exceeded 80,000, with a total capacity of almost 1.2 GW. The Romanian Ministry of Energy states that the country has significant natural potential for developing solar energy, with 1,900 to 2,400 hours of sunlight per year.

BULGARIA – Data presented in SolarPower Europe show that in 2023, Bulgaria installed more than 1 GW of new solar power plants connected to the power grid, and thus, at the end of that year, had a total capacity of almost 3 GW. The country's success is reflected in its National Energy and Climate Plan (NECP) for 2030, which has set a goal of 3.2 GW, which it almost achieved seven years ahead of schedule.

Prepared by Katarina Vuinac

## THE BENEFITS OF AGRISOLAR

Agrisolar is solar energy integrated into agricultural activities, and its application's potential and benefits are being increasingly utilized daily. Thanks to agrisolars, agricultural activities that require electricity use become more sustainable because they use green energy. At the same time, the use of fossil fuels is reduced. There are also benefits for crops grown on land where a solar power plant is installed. So far, the practice has shown multiple benefits, including solar technology protecting crops from too much sun and extreme weather conditions, such as wind or hail. Moreover, research indicates that applying agrisolar systems can increase soil productivity by up to 70 per cent. The data also show that the global energy demand could be met if less than 1 per cent of arable land were repurposed for agrisolar systems. In that case, agricultural activities would still be carried out at a certain location despite solar power plants being installed in the same location.

# INVESTING IN SUSTAINABLE MANAGEMENT OF RES

Serbia will accomplish the green transition of its energy sector through the increase of renewable energy sources, the improvement of power grids and energy storage, the promotion of fuels with zero carbon dioxide emissions, and the gradual abolition of fossil fuels. The goal is to transform the sector into a sustainable, efficient, and inclusive system that is adapted and resistant to climate change, with a significant increase in energy efficiency and respect for the principles of a fair transition. We talked with Milena Popović Martinelli, Climate Strategy Delivery Principal for the Western Balkans, about the support provided by the European Bank for Reconstruction and Development (EBRD), challenges created by the energy transition, and plans.

**Q: What challenges is the green transition facing, and how does the EBRD support Serbia's effort in this transition?**

A: One of the EBRD's key priorities in Serbia is to support the acceleration of the energy transition while ensuring the security of the energy supply and boosting economic growth and social development. The EBRD is engaged in many complex aspects of decarbonization, too. We invest in renewable energy sources, and in March of this year, we supported the Pupin project, a 94.4 MW wind farm. Pupin is the second phase of the development of the Kovačica wind farm (which we also co-financed back in 2017) and is



Photographs: (top) Unsplash/Tim Van Der Kuip; (midle right) Unsplash/American Public Power Association

The EBRD's three key priorities for Serbia are expediting the green-energy transition, boosting the private sector's competitiveness, productivity, and access to financing, as well as financing sustainable infrastructure and facilitating regional connectivity

**MILENA POPOVIĆ MARTINELLI is a climate policy implementation expert at the EBRD. Currently, she is engaged in sustainable and green development projects in the Western Balkans. During her 20 years of professional engagement, she gained experience in improving business processes and implementing business strategies through mergers, acquisitions, and restructuring.**

the first to obtain financing among bidders at the first market premium auctions. We also support the reconstruction of the Vlasina hydropower plant to extend its useful life and increase the installed capacity, which is significant both for the supply and the balancing of renewable energy in the country.

We recognize that the energy sector is affected by climate change and support our clients in aligning their business models and operations with low-carbon and climate-resilient development principles. While acknowledging the Electric Power Industry of Serbia's (EPS) role in the country's effort to decarbonize, the EBRD provides support to the company in developing a decarbonization action plan in accordance with

Photographs: (middle right) Unsplash/Noah Buscher; (Popović Martineli) courtesy of Milena Popović Martineli (middle bellow) Unsplash/Zbynek Burival

national green ambitions, as well as assessing the impact that climate change may have on business.

Furthermore, through our just transition initiatives, we support the Serbian government in understanding the impact of the energy transition on the most affected regions and communities. We are working to identify and prioritize specific interventions to ensure the transition is fair and inclusive.

**Q: How interested are investors in investing in renewable energy sources in Serbia?**

A: The Serbian renewable energy market has proven very competitive, and investors recognize its potential. An adequate regulatory framework, with a clearly defined plan and goals, is a prerequisite for creating a favorable business environment. The Serbian market demonstrated that it meets the key criteria related to market premium auctions, at which bids for electricity from wind turbines significantly exceeded the available quota, were competitive, and well below the maximum price. With Serbia's three-year plan to allocate 1,300 MW of capacity at auctions and the goal of reaching a 45 per cent share in electricity production from renewable energy sources by 2030, we expect that many will carry out new investments in the market.

**Q: Are there other aspects of the transition that you consider significant to which the EBRD will pay special attention in the coming period?**

A: Renewable energy production is key to decarbonizing the energy sector, but a successful transition requires a holistic approach that also focuses on other priority areas. There is a consensus and a deep understanding of energy demand, which can be seen in implementing energy efficiency projects in public and residential buildings.

The EBRD stands out as an international financial institution that pays special attention to the energy rehabilitation of residential (multi-family) buildings, including buildings with the worst energy performance.

In cooperation with the Ministry of Mining and Energy, we are preparing a Public ESCO Project, an innovative format with significant impact and coverage that will be implemented on millions of square meters. As part of the first public call for the project implementation, energy rehabilitation will include up to 1.1 million square meters of residential buildings connected to district heating in

In cooperation with the Ministry of Mining and Energy, we are preparing a Public ESCO Project, which is an innovative format with significant impact and coverage that will be implemented on millions of square meters



Photographs: (bottom) Unsplash/Biel Morro; (middle) Unsplash/Markus Spiske

14 Serbian cities. The Public ESCO Project will enable the simultaneous implementation of energy efficiency measures in the most energy-inefficient residential buildings throughout the country. It will be the basis for transitioning from flat-rate billing to billing only for the consumed heat. It will contribute to significant energy savings, reduce emissions and pollution, and improve air quality in numerous towns in Serbia.

**Q: What help and support does the EBRD provide in preparing and implementing auctions for solar and wind power plants?**

## SUPPORT FOR THE DISTRICT HEATING SYSTEM

The EBRD is particularly proud of the upcoming signing of a contract on the Renewable District Energy Serbia project, which involves using solar-thermal systems, geothermal energy, and heat pumps in district heating.

"Some of these technologies will be used for the first time in the district heating system in Southeast Europe. For instance, in Kragujevac, one of the cities included in the project, waste heat from the State Data Centre generated by cooling servers will be used. Donors have recognized the innovativeness and importance of the project, and we expect that the project will be co-financed from investments and technical grants by the Swiss State Secretariat for Economic Affairs and the European Union under the auspices of the Regional Energy Efficiency Programme", says Ms Popović Martinelli.

In parallel, the EBRD is developing a Large-Scale Solar Thermal Project with Seasonal Storage, which will be implemented in the district heating system in Novi Sad.

> The Serbian renewable energy market has proven to be very competitive, and investors recognize its potential

A: With the support of the Swiss State Secretariat for Economic Affairs, the EBRD played a significant role in conducting auctions to allocate market premiums. We supported the Serbian Ministry of Mining and Energy in the implementation of competitive procurement for renewable energy projects and regulatory reform in the energy sector to facilitate the implementation of auctions, which culminated in the successful allocation of 400 MW of wind capacity and 25 MW of solar capacity in the summer of 2023. The first auctions for allocating market premiums based on the format of bilateral contracts for price difference will help develop over 700 MW of new green energy capacities in Serbia. The auctions were conducted in line with the best European practices. The transition to market premiums enables better cost management and significantly benefits the entire energy system. As for the next round, we can expect that the capacities will be determined in accordance with the three-year plan that sets a quota of 300 MW for wind power plants and 100 MW for solar power plants.

**Q: What is foreseen in the EBRD 2023-2028 Strategy for Serbia regarding renewable energy sources, and what are the relevant plans?**

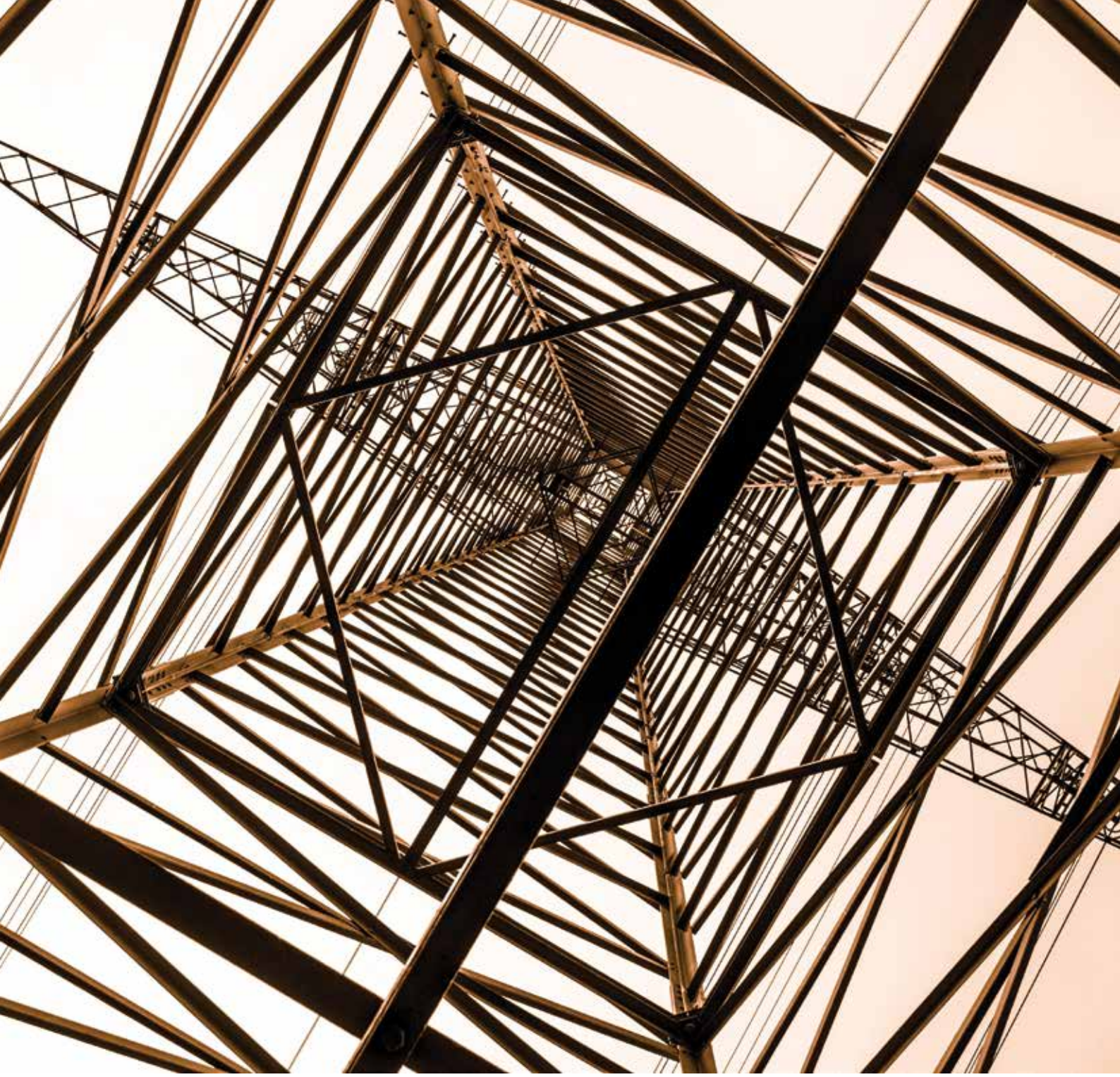
A: The EBRD's three key priorities for Serbia are expediting the green-energy transition, boosting the private sector's competitiveness, productivity, and access to financing, financing sustainable infrastructure, and facilitating regional connectivity.

Regarding the first priority, the EBRD will focus on increasing the capacity of renewable energy sources through continued support in organizing wind and solar auctions and the use of renewable energy sources in district heating systems. Energy efficiency will also be a primary goal, especially in the context of energy renovation of buildings.

The current energy mix is still significantly unbalanced, with a significant share of electricity generation from coal. Decarbonizing the energy sector is recognized as one of the strategic goals. We welcomed the changes in the regulatory framework that facilitate the development of new investments in renewable energy sources. Looking ahead, we expect that there will be a diversification of the energy mix thanks to the increased capacity of renewable energy sources, which is crucial both for environmental reasons and in terms of security of energy supply. A key challenge will be ensuring that the system, especially the power grid, can accommodate the variability associated with renewable energy sources. We also recognize the importance of different energy storage solutions.

Interview by Mirjana Vujadinović Tomevski

Photograph: Unsplash/Call Me



# ENCOURAGING COMPETITIVENESS IN BUYING AND SELLING ELECTRICITY

As an energy entity responsible for organizing and managing the electricity market in Montenegro, the Montenegrin Electricity Market Operator (COTEE) continuously works to improve this segment while following trends and changes in the market of the region and Europe to create an open, transparent and non-discriminatory market environment as possible. COTEE creates conditions for a better and more competitive electricity market. Together with the electricity exchange,



Photograph: Pixabay/Thomas

In its 2023 decree, the Government of Montenegro additionally reduced the fee for the production of electricity from RES by 50 per cent to take a responsible approach to consider the needs of individual citizens

COTEE should enable energy entities with surpluses or electricity deficits to sell and buy it, respectively, while facilitating competitiveness and transparency of the entire process in Montenegro. We spoke with Mersudin Gredić, the Executive Director of COTEE, about the COTEE's operating principles, how individuals can relieve themselves of the cost of renewable energy sources (RES), and how producers can get better market conditions, the advantages of guaranteed purchase of electricity, the development of solar energy, electricity trading in Montenegro and plans for the next period.

**Q: How do the processes related to improving the electricity market in Montenegro affect renewable energy sources?**

A: The development of the electricity market, which is our prerequisite for joining the European Union, as well as the harmonization of national regulations with the European ones, have a positive effect on the development of renewable energy sources, which is evidenced by the great inte-

**MERSUDIN GREDIĆ was born in Bijelo Polje, Montenegro. He graduated law and subsequently worked in a law firm in Bijelo Polje. He was also an expert associate for legal issues in the parliamentary caucus in the Montenegrin Assembly, where he also worked as a lawyer. Mr Gredić was a permanent member of the Bijelo Polje Municipal Election Commission and the secretary of the Ministry for Human and Minority Rights. Furthermore, he worked as a co-chairman of the Montenegrin-Croatian intergovernmental commission and as the Montenegrin government's representative on the Board of Directors of the Fund for Protecting and Upholding Minority Rights. From 2017 to 2021, Mr Gredić was the deputy general secretary of the Montenegrin Assembly and from 2022 to 2023, the government's representative for resilience in NATO. From 2022 to 2023, he was the state secretary in the Interior Ministry, and from 2023 to date, he has been the executive director of the Montenegrin Electricity Market Operator (COTEE). Mr Gredić is also a member of several governmental, departmental and interdepartmental working groups and commissions, with a particular emphasis on membership in the working group for the accession Chapter 24 and the working group for Montenegro's accession to NATO.**

Photographs: (left) Unsplash/Anthony Indraus; (Gredić) courtesy of Mersudin Gredić

rest of investors in the development of new projects in this area.

**Q: How can individuals be relieved of the cost of RES and producers having better market conditions?**

A: In its 2023 decree, the Government of Montenegro additionally reduced the fee for the production of electricity from RES by 50 per cent to take a responsible approach to consider the needs of individual citizens. In this way, individual producers must pay a significantly reduced fee to improve their overall economic standard. This year, we did not have requests from privileged producers to enter the market from the feed-in tariff. Several privileged producers who entered the market in the previous period returned to the incentive system this year. This indicates that the privileged producers assessed that now is not the moment to enter the market due to low electricity prices.

**Q: How would you assess the current development of solar energy and solar power plants in Montenegro, and what are your plans? How is the**

Five solar power plants with an installed capacity of 2.2315 MW are included in the incentive system. Since we have many sunny days, there is great potential for developing solar power plants



Photograph: Pixabay/Couleur

Development projects related to renewable energy sources contribute to the accomplishment of not only energy goals but also environmental protection goals, which are one of Montenegro's strategic goals

## GUARANTEED ELECTRICITY PURCHASE

The advantages of guaranteed electricity purchase compared to the changing market are the guaranteed price, the guaranteed purchase of all electricity produced for years, and the exemption from payment of system balancing services for privileged producers, all of which align with the Law on Energy.

"COTEE covers the balancing costs generated by privileged producers", says Mr Gredić.

**implementation of the SOLARI 3000+ and 500+ projects going?**

A: Five solar power plants with an installed capacity of 2.2315 MW are included in the incentive system. Since we have many sunny days, there is great potential for developing solar power plants. Implementing these projects has multiple benefits and indeed represents a significant parameter for the overall development of the energy sector and overall economic progress.

When it comes to the SOLARI 500+ and 3000+ projects, Elektroprivreda Crne Gore is the chief project partner in carrying out project activities. The company recognized that the projects would be in the best interest of both individuals and legal entities in ensuring the use of this type of energy. In line with its business policies, the company implements these important projects. Development projects related to renewable energy sources contribute to accomplishing not only energy goals but also environmental protection goals, one of Montenegro's strategic goals.

**Q: How is electricity traded in Montenegro, and what are you planning to do in the coming period following the Energy Law?**

A: Our country has an excellent connection with the Western Balkan and EU countries (undersea cable with Italy), which has helped Montenegro be viewed as one of the more interesting countries in this part of Europe. This good position was further boosted by the launch of the day-ahead market a little more than a year ago by the Electricity Exchange. Following the adoption of the new Law on Energy and the National Energy and Climate Plan, the obligations and plans of energy companies will be better specified in the coming period, and this segment's development will increase.

**Q: How much does the current situation with energy sources in Europe and the energy crisis affect the price of energy and the economy in Montenegro?**

A: Responsible energy policy, implemented by the Montenegrin government, all energy sector participants, and the Energy and Water Regulatory Agency of Montenegro, has resulted in the burden of the energy crisis not being transferred to end users. Taking care of the best interests of end users and market participants while ensuring the security of supply and system stability will continue to be the focus of both COTEE and other relevant organizations.

Interview by Mirjana Vujadinović Tomevski

Photograph: Pixabay/Tom


# SAFE TRAVELS IN EUROPE WITH CHARGE&GO

A well-established network of chargers is a prerequisite for safe and secure travel with an electric vehicle. Strategically located chargers along highways, busy traffic routes, and in cities facilitate drivers in planning their trips.

With a mobile application that enables a quick and easy search for electric chargers and payment for charging sessions, every journey becomes a real pleasure. Charge&GO strives to make travel easier for its users, both in Serbia and across Europe.

The company is actively expanding its network of chargers to be well-prepared for the summer season and tourists traveling to the seaside with their electric cars. New DC chargers are ready, operational, and listed on the Charge&GO app. Recently, a 60-kilowatt charger was installed in

By the year-end, the number of available chargers will be increased, with the Charge&GO Company playing a major role in this progress



Photographs: *Charge&GO*

the parking lot of the BIG shopping center in Rakovica. There are plans to install several more chargers, which are also located in the parking lots of BIG shopping centers throughout Serbia. There are also chargers at OMV gas stations. A 120-kilowatt charger is available on the bypass road near Surčin, while on the other side of the highway, also at an OMV gas station, there is a 150-kilowatt electric charger. By the year-end, the number of available chargers will be increased, with the Charge&GO Company playing a significant role in this progress.

## How to find a charger abroad?

When it comes to traveling abroad, Charge&GO app users have access to more than 400,000 chargers that are part of Hubject, the largest European e-roaming network. The process of accessing these chargers is very simple, allowing users to start charging with the help of the map, RFID card, and the app. Users will find the nearest charger abroad quickly and easily. Navigation opens by clicking on the icon of the desired charger, showing detailed directions to the requested location.

To use these services, the user has to sign a contract, and the whole procedure is greatly simplified. A request for this service should be sent to podrska@chargego.rs. After signing the contract, users will immediately have access to a map full of AC and DC chargers across Europe upon leaving our country.

With the expansion of the charger network, Charge&GO is also expanding its app's availability beyond our country's borders. Therefore, they have created a multilingual and multi-currency platform that supports different regulations in individual markets. Electric car drivers will no longer need to switch apps when crossing from one country to another; they will use only Charge&GO, which is easy to manage and compliant with all regulations in each market where they offer services.

> Charge&GO strives to make travel easier for its users, both in Serbia and across Europe


## What is Charge&GO?

Charge&GO is the first regional platform and mobile application with a network of chargers that enables quick and easy charging of electric vehicles. The platform provides electric vehicle drivers with an efficient charging service, with each session automatically billed to the user's account. Platform users can see a detailed overview of all charging sessions, completed payments, and account top-ups. Additionally, the Charge&GO customer service center is available at all times for any kind of assistance and to resolve any uncertainties.


Prepared by Milica Radičević

# THE SERBIAN ELECTRICITY EXCHANGE ENSURES THE HIGHEST EUROPEAN STANDARDS

After almost a decade since its foundation and becoming operational in February 2016, the Serbian Electricity Exchange (SEEPEX) has firmly positioned itself not only as an important support provider in green transition and further liberalization of the electricity market in Serbia but also as a significant integrative factor in stock exchange business in a broader regional, interregional and one could even say pan-European context. After the establishment of the first regional electricity exchange in the regions of Southeastern and Central Eastern Europe, the Alpine-Adriatic-Danube Electricity Exchange (ADEX), established in December 2022 through the corporate merger of SEEPEX and the Slovenian electricity exchange BSP, it was officially announced that in 2024, the Hungarian stock exchange HUPX will be added to that unique business infrastructure.

After this year's drastic energy crisis and price consolidation, this news, as well as the current situation and further development directions of the European electricity market, are the reasons we talked to Miloš Mladenović, founder and director of SEEPEX.

SEEPEX and partners from the ADEX Group continue to push the boundaries and ensure the highest European standards in stock exchange business infrastructure. In a way, it has brought to life its initial idea of forming a single regional stock exchange.

"This significant business success at the end of the first decade of SEEPEX's operations came as the icing on the cake of the company's successful and profitable business, which in just a few years profiled itself as a relevant national and regional trading place, with a fully rounded spot market framework. Last year, the intraday segment of spot trading was also launched with more than 40 participants from 16 European countries and a volume of almost 5TWh of electricity traded in the day-ahead

The first practical results of the planned synergy within ADEX were achieved after a few months, i.e., by establishing an intraday market in Serbia in late July last year



Photographs: (top) Pexels/Eric Anada; (bottom) Pexels

Last year, the intraday segment of spot trading was also launched with more than 40 participants from 16 European countries and a volume of almost 5TWh of electricity traded in the day-ahead market

Miloš Mladenović, **founder and director of SEEPEX**

market. Those business results were accomplished during the so-called 'isolated' operations, which is the first such case in the region, where all other stock exchanges (including those from the EU) began to accomplish such business and financial results only after the implementation of market merger projects and the significant increase in liquidity that they consequently brought", said Mr Mladenović.

He pointed out that all of the above was due to believing in the success and commitment of all parties who participated in the company's establishment and operations, not only from SEEPEX and Elektromreža Srbije but also from a wider area, including the institutions that came forward to meet the necessary, and on a couple of occasions, systemic interventions on changes and additions to the energy sector, market and financial regulations. First of all, this is the fruit of the set, the far-reaching vision of SEEPEX as a modern European stock exchange that will operate fully in accordance with the best European practice and have a clear regional perspective.

## The multifaceted importance of the common stock exchange

The formation of ADEX, the corporate association of the stock exchanges of Serbia, Slovenia, and Hungary, was a significant step forward in this segment of the region.

"The importance of forming a joint stock exchange for all three parties is truly multifaceted, not only in terms of the electricity market, security of supply and more efficient integration of renewable energy sources, but also on a strategic, and one might say, geopolitical plan, above all in the context of integrative activities towards the European Union", Mr Mladenović adds.

Photographs: (middle) Pexels; (Mladenović) courtesy of Miloš Mladenović

He reminded us that the so-called BlueSky project was initiated in 2017 by SEEPEX and its founders (EMS and EPEX SPOT) as an instrument for realizing SEEPEX's initial vision of establishing a regional electricity exchange. Due to an insufficient understanding of political structures from the relevant countries, which are the most important and natural interlocutors regarding that plan, SEEPEX turned to partners from the EU.

"The project implementation was carried out in two phases. The first phase, which involved the corporate integration of the Serbian and Slovenian stock exchanges and the establishment of the ADEX Group, was successfully completed at the end of 2022, while negotiations with Hungarian partners were also completed last year. The transaction document on HUPX joining this unique business infrastructure was signed in December 2023", explains Mr Mladenović.

The first practical results of the planned synergy within ADEX were achieved after a few months, i.e., by establishing an intraday market in Serbia in late July last year. In April of this year, the process of transforming the business model of the Slovenian Stock Exchange (BSP) was completed in such a way that the clearing function and the platform for day-ahead trading were harmonized

The formation of ADEX, the corporate association of the stock exchanges of Serbia, Slovenia, and Hungary, was a significant step forward in this segment of the region



Photograph: (bottom) Pexels

with SEEPEX's business model, i.e. by applying the best European practices used in all EPEX SPOT markets. With the introduction of a unique membership process and a harmonized price list, all Serbian and Slovenian spot market participants will be provided with the so-called one-stop-shop solution, where all the accompanying benefits of such a solution will be at their disposal. These include a unique business and clearing infrastructure, netting and cross-margining of collateral, a uniform procedure and reduced costs of accessing spot markets. The plan is to boost further the synergy with Hungarian partners in the near future.

"In the Serbian market, the establishment of the intraday spot market is included in the legal framework as one of the essential prerequisites for the efficient integration of renewable sources of electricity and the successful implementation of a new incentive scheme based on auctions for concluding long-term financial purchase contracts (the so-called contract for differences), where the contracting party responsible for the state's implementation of those fifteen-year financial contracts would be the guaranteed supplier (i.e. the Electric Power Industry of Serbia - EPS), while the physical delivery of the produced energy and the balance responsibility would fall on the producers themselves", explains Mr Mladenović.

Of course, SEEPEX's role in incentive measures is much broader, primarily in the context of providing a relevant and robust reference price to which the mentioned financial contracts refer, as well as ensuring a sufficiently liquid day-ahead market that will be able to accept the entire amount of produced energy without a significant impact on the price. So, it is safe to say that, with these latest improvements, a complex market puzzle has been completed and can now successfully respond to all the challenges that the green transition imposes on the electricity market and, therefore, support planned activities of state institutions aimed at achieving the proclaimed, very demanding goals contained within Serbia's Integrated National Energy and Climate Plan (INEKP).

## Financial protection of market participants

As the operator of the organized electricity market in Serbia, SEEPEX plays an important role in the liberalization of the national electricity market and in accomplishing the set green transition goals. SEEPEX also played a vital role in ensuring the security of supply during the energy crisis and the functioning of the market in critical regimes. Mr Mladenović says SEEPEX, like other European energy exchanges, showed its multifaceted importance in those border regimes during the energy crisis by establishing a transparent and efficient trading place. SEEPEX also provided complete security and financial protection to all market participants, even in such high-risk business conditions that the entire sector faced. Furthermore, the robust reference prices based on the marginal price principle are the only effective instrument, which, in addition to already known benefits, can also serve as an alarm bell and initiate specific changes and activities so that similar situations and challenges are not repeated in the future.

According to Mr Mladenović, the proposal for a new market design, which finally took shape in mid-2023, was initiated by the last energy crisis and enormously high prices. Essentially, it is a response to the growing challenges and shortcomings and, in some cases, also to the economic illogicality of the very strict green transition of which we have been a part for a long time now.

Prepared by Mirjana Vujadinović Tomevski

Photographs: (top) Pexels/Weekendplayer; (middle) Unsplash/Fre Sonneveld

# SIEMENS SOFTWARE SOLUTIONS FOR A SUCCESSFUL TRANSITION OF ELECTRICAL POWER SYSTEMS

The aspiration of countries to become energy independent, along with the indispensable need to stop climate change, leads to the accelerated development of renewable energy sources (RES). Considering the progress of underdeveloped and developing countries, all of the above affects the stability of electrical power systems.

For the energy sector to develop smoothly and as efficiently as possible, it is necessary to include software solutions in the processes. The company Siemens Belgrade offers services that facilitate the management and decision-making of electrical power systems for end clients. We spoke with Goran Lepović, the head of Grid Software at Siemens doo Belgrade, about what Grid Software is and how it contributes to effective solutions in the field of energy.

**Q: How would you describe your field of activity and its role within Siemens?**
A: Business I manage within Siemens doo Belgrade is called Grid Software and deals with a relatively broad portfolio of services. First, I would single out Grid Control, which is the department that deals with dispatching SCADA systems. In this field, our clients are operators of transmission and distribution systems and industrial clients. Engineers in our team work on various tasks related to Siemens' Spectrum Power SCADA system on projects worldwide. Currently, through different Siemens HUBs, American, German, and Austrian, our team works on worldwide projects from California (CAISO) to Hong Kong (HKE). Also, our engineers within the Belgrade teamwork on the maintenance of the SCADA system and the local market, primarily in Bosnia and Herzegovina, the Republic of Srpska. Another part of the portfolio that Grid Software deals with is Grid Simulation, i.e., the distribution of licenses and the organization and conducting of software training within the Siemens PSS® portfolio,

which includes software tools such as PSS®Sincal, PSS®E, PSS®ODMS, and PSS®CAPE. We currently have clients in all countries of the region for which the office in Belgrade is responsible. We have organized and conducted six trainings in these software in the last six months. The third part of the Grid Software portfolio concerns the creation of electrical power system analysis studies in various application software owned by Siemens (such as PSS®E and PSS®Sincal), but also in software from other manufacturers, such as DigSilent, ETAP, Plexos,



Photographs: (top) Pixabay/Tung Lam; (middle right) Siemens

The current forecast says that global consumption will double in the next decade, which is why there is an increasing need for the connection of renewable energy sources. It is not possible to connect such a quantity of RES without detailed analyses of the development of electrical power systems, most often in analysis software such as PSS®E and PSS®Sincal

Goran Lepović
**head of Grid Software at Siemens doo Belgrade**

etc. The markets where we offer consulting services are mostly related to the Middle East, Australia, Turkey, the Balkans, and Africa.

**Q: What would you single out as the main challenges that Grid Software is currently facing in the energy industry?**
A: Challenges are numerous today, taking into account the speed of the transition of electrical power systems, the influence of renewable energy sources, the reduction of the inertia of transmission systems caused by changes in terms of the penetration of distributed sources of production, but also challenges regarding the low price of an engineering hour that comes from the area of cheaper labor (India, Pakistan, South America, etc.).

**Q: How does Grid Software contribute to finding effective solutions in the field of energy?**
A: Today, there is a great demand for products from our portfolio from end clients. There is a huge need for a great variety of services, including precise measurements and data acquisition, automation of production processes, system analysis, and cost-benefit analysis that can lead to process improvement and proper assessment of necessary investments. Also, the current forecast says that global consumption will double in the next decade, which is why there is an increasing need to connect renewable energy sources. It is impossible to connect such a quantity of RES without detailed analyses of the development of electrical power systems, most often in analysis software such as PSS®E and PSS®Sincal.

**Q: In which parts of the world do your projects take place?**
A: Engineers from our Grid Control team are currently working on various SCADA projects, including the North American market (clients APS, Arizona and CAISO, California), Asian (ADDC, Abu Dhabi, AADC, Al Ain, HKE, Hong Kong), European (APG and OSC, Austria, Elektroprenos and ERS, BIH, REE Spain, which is also the most significant project on which our team is engaged including 14 engineers, PSE, Poland, etc.), but also the African market (N-NECC Egypt). As far as the software from the PSS® portfolio is concerned, we are engaged in the projects of the countries of the Balkan Peninsula. In the study analyses, I will highlight the creation of the Master Plan and engineering recommendations for the client FEWA from Dubai, the United Arab Emirates. Also, the projects we do for the largest oil company in the world, Saudi Aramco from Dammam, are significant.

**What would you single out as a success that you are particularly proud of?**
A: We are particularly proud of our cooperation with the Electrical Engineering Faculties in Belgrade, Podgorica, Banja Luka, and Travnik. Being present at the faculties and collaborating with professors and students on different projects is always a pleasure.

**Q: In your opinion, what is the key to successful business in the field of energy?**
A: The key to success is both in the team and in each team member, i.e., in the investment of each individual in himself. Today, we are in a situation where energy is changing faster than ever, and the advantage of the people who work in my team is that they can constantly invest in themselves through work and learning on projects, as well as through internal training in various fields. I feel responsible for ensuring that every team member is satisfied and that we solve all possible problems correctly and on time to maintain an honest relationship, which is the key to achieving good results.

Siemens

Photographs: (left) Siemens; (Lepović) courtesy of Goran Lepović

# FROM GLASS WASTE TO CONSTRUCTION MATERIAL

The fact that there is room for innovation in the construction material industry is evidenced by the company Fragment from Čačak. Its founders, Marija Marković and Pavle Milošević, patented a revolutionary construction product that captivates with its beauty and sustainability.

We are talking about Fragment panels, which contain 75 per cent recycled glass collected directly from local sources. These panels are characterized by exceptional strength that surpasses marble and natural stone, making them a durable and reliable material for various applications.

Marija Marković, an artist and environmental activist who received her master's degree in New York, says that the idea of producing Fragment panels arose from an experiment connected with art and ecology.

– We started with the desire to make a sculpture and find a solution for the bottles piling up in our households. In many parts of Serbia, it is not easy to dispose of recyclable waste, so we decided to try to make a material similar to terrazzo. When we first polished the material, it looked fantastic. We still keep that first tile as a reminder of our beginnings – our interlocutor explains.

However, the initial appearance of the material was far from the products the company offers today. Since glass and cement do not mix well chemically, these innovators



Photographs: Marija Marković

embarked on two-year research that included cooperation with the Faculty of Technology and Metallurgy in Belgrade and the Faculty of Technical Sciences in Čačak.

– That cooperation started well, and we are still successfully maintaining it. After over 2000 experiments, we were finally satisfied with the mechanical and aesthetic properties of the Fragment panel – Marija says.

The company currently offers 17 different panel designs suitable for interior and exterior use. These panels have been used to make fountains, outdoor furniture, ledges, bathroom walls, kitchens, bars, and various tables.

– Fragment panels have an A1 flammability class, which guarantees that they do not burn, do not spread fire, and do not catch fire in the event of a fire. They are adaptable to the specific needs of each project because they can be cut into different shapes. Our protective coatings are certified for food contact, ensuring safety and hygiene in all applications. In addition, they are UV neutral, which means they are resistant to harmful UV rays and will not fade or lose their properties under the sun's influence – she points out.

Fragment panels are breathtaking in their appearance. They have depth; they shimmer and refract light in a way that creates a feeling of being lost on the surface. Even to the touch, they are very interesting and unique.

Fragment panels have an A1 flammability class, which guarantees that they do not burn, do not spread fire, and do not catch fire in the event of a fire

## Production with the highest standards of sustainability and safety

When it comes to producing Fragment panels, Marija explains that the process includes several steps, including the composition of a recipe of raw materials and glass in different granulations to achieve the best mechanical properties while maintaining an attractive appearance.

– First, we mix the raw materials to obtain a homogeneous mixture. Then we pour that mixture into molds and dry it under controlled conditions to achieve optimal strength and durability – Maria explains, adding that the panels are further calibrated and polished, and according to the wishes and needs of the customer, they are treated with protective coatings that further improve their properties, such as stain and chemical resistance.

She adds that they pay great attention to protecting the environment and the health of the workers and users of the panels. Only environmentally friendly materials and production processes that meet the highest standards of sustainability and safety are used. Edge treatment is also important to make the panels safe to handle and install.

This unique product has already attracted many people's interest, primarily due to its aesthetic properties. However, the company mainly cooperates with architects and interior designers who, in addition to the aesthetic, have recognized the functional value of the panels.

– From a market point of view, we have cooperation and offers from Scandinavian countries, probably because the idea of circular economy is very present and developed in these countries. Also, lately, we have received several offers from Italy – Maria points out with pride.

## New products on the horizon

The company Fragment will undoubtedly realize all its ambitious plans because, in addition to this artist, its management includes Pavle Milošević, an economist who has been working on the development and innovation of environmentally friendly products for over 10 years.

The two of them recently added two new machines to their production facility, which will significantly facilitate the production process and enable easier experimentation, opening up possibilities for new products.

They plan to investigate the properties of panels with a higher proportion of glass, different granulations, and different thicknesses. Their mission is to mass produce, thereby removing even more glass from the environment, contributing to environmental sustainability. Also, they are working on expanding the range of designs and improving technological processes to provide even better and more innovative products. They aim for Fragment to become a synonym for ecologically sustainable and aesthetically appealing construction material.

Prepared by Milena Maglovski

# PROSUMERS – AN IMPORTANT LINK IN SERBIA'S ENERGY TRANSITION

Although present on Serbia's energy scene since 2014, the concept of prosumers only truly took off two years ago, and its popularity continues to grow daily. Citizens, businesses, and numerous institutions can now generate their own electricity from renewable sources, and any excess production from their plants can be fed back into the power grid.

Obtaining the prosumer status has numerous benefits, including significant savings on electricity bills, energy independence and security, environmental benefits, and contributions to the national energy transition.

According to data from the Electric Power Industry of Serbia, around 3,200 prosumers currently produce green kilowatts in our country. The majority are households, with 2,300 registered as prosumers, with about 840 production facilities and an increasing number of institutions, including schools, kindergartens, student centers, monasteries, and institutes.

Most prosumers have opted to install solar systems on their roofs, many motivated by subsidies for installing solar panels offered by the Republic of Serbia since 2021. Prosumers are essential for the successful energy transition of our country. They increase the percentage of renewable energy sources in the domestic energy mix, help relieve the power grid, achieve financial savings, and reduce carbon dioxide emissions. Thus, support for prosumers and their further development has been recognized as one of the priorities in Serbia's energy policy to ensure a sustainable and secure energy future for all.



Photograph: Pixabay/Solarimo

Regulations and laws related to the renewable energy sector have been revised multiple times to best meet investors' needs, and this year, amendments to the Energy Law are planned. These will, among other things, establish a system for certifying installers of solar systems, heat pumps, and other renewable energy systems to ensure consistent and standardized service quality for citizens and businesses.

## How to Achieve Prosumer Status

The Law on the Use of Renewable Energy Sources outlines how one can achieve prosumer status. The process has been simplified to encourage as many citizens, entrepreneurs, and institutional representatives as possible to embrace renewable energy sources.

Before applying for a contract with a supplier, the end consumer must construct a facility to produce electricity from renewable sources for their use, with any surplus energy delivered to the system. At the beginning of the year, a regulation set a limit of 10.8 kilowatts for households and up to 150 kilowatts for other categories of prosumers.

To achieve prosumer status, the end consumer must adjust the metering point in accordance with regulations and standards. The application for the contract must include a Notice of Meter Adjustment issued by the distribution system operator.

One of the electricity market suppliers in the Republic of Serbia is the joint-stock company Electric Power Industry of Serbia Belgrade, which participates in concluding full supply contracts with net metering or net billing with prosumers. The supplier is then obliged to offer the prosumer a full supply contract with net metering for households or net billing for other categories in accordance with the appropriate criteria and conditions prescribed by law.

According to currently available data, households that have installed solar panels in Serbia achieve average monthly savings of up to 1,500 dinars, depending on the size of the system and the amount of energy produced

## Conclusion of Contracts with Net Metering or Net Billing

In Serbia, prosumers use net metering and net billing, which allows them to utilize the energy produced for their consumption and deliver any excess energy to the grid, thereby achieving significant savings.

Once the supplier processes the submitted application, a contract with the prosumer is concluded through two models: the full supply contract with net metering for households and the full supply contract with net billing for other categories.

A recent regulation on the incentive fee for privileged electricity producers is significant for households and industrial prosumers. The most important innovation is the reduction of the fee costs for prosumers who generate green energy for their own needs, while the fee amount remains unchanged for other consumers.

The regulation prescribes the method for calculating the fee for privileged electricity producers paid by end consumers. The new regulation further facilitates and improves the financial position of prosumers since the fee calculation base is based on net electricity, not the electricity taken from the grid.

The system operator registers the end consumer in the Prosumer Register, completing the process of obtaining prosumer status.

Once "members" of the prosumer club, both individuals and legal entities, become active participants in generating electricity from renewable sources, they will benefit themselves and the entire nation.

## Significant Savings with Solar Panels

Those interested in becoming prosumers often ask about the actual savings they can achieve. The answer depends on several factors, including the size and capacity of the installed electricity generation system, the amount of energy produced and consumed, and the price of electricity from the grid.

According to currently available data, households that have installed solar panels in Serbia achieve average monthly savings of up to 1,500 dinars, depending on the size of the system and the amount of energy produced.

Amendments to the law have been adjusted to meet the needs of prosumers, and changes in billing have led to a 30% reduction in tax-related expenses compared to the period before the amendments.

Additionally, those who opt for electronic invoice delivery receive a monthly discount of 50 dinars, a benefit currently used by more than 700 prosumer households. Households are also offered a 5% discount on electricity consumption for timely bill payment.

Changes to the permit issuance procedures have also been announced, as the number of applications for prosumer status has significantly increased.

Prepared by Milena Maglovski

# PV POWER PLANTS ON FLAT ROOFS

Designing and planning rooftop PV plants is one of the most challenging steps towards the realization of your dreams of having green energy produced by sunlight. Hardly any rooftop project is more demanding than designing and installing PV power plants on flat surfaces. Flat roofs are considered those inclined up to 3°, and most are covered with membranes (PVC, TPO or bitumen-based) or even concrete, so solar industry experts avoid drilling them.

So, when we talk about flat roofs, we refer to low-ballast PV systems, where the mounting systems that hold the PV modules are ballasted rather than attached to the flat roof, as is the case with pitched roofs. The concept behind the design of flat roof PV systems is to connect PV modules in groups, using their weight and ballast to resist wind forces – as a group.

The solar industry developments have shown that the most optimal inclination of PV modules on flat roofs is 10° and 15°, which have recently become industry standards. This means a more aerodynamic system requiring less ballast than it would under an optimal inclination angle, which in a big part of Europe would be 30°. The most optimal PV module inclination angle thus gives way to the aerodynamic balance and, therefore, a reasonable amount of ballast that the roof structure can still withstand. Research has shown that the PV module pitch higher than 15° precipitates into exponential growth of the amount of ballast.

The amount of ballast is at K2 Systems calculated using the proprietary planning software K2 BASE ON, in which all parameters that influence the structural verification of the mounting systems on flat roofs are factored in: wind speed, snow load, terrain category (as per Eurocode norm), building height, eaves parapet height, roof pitch and friction coefficient between the roof membrane and the mounting system itself which must be measured each time on-site.



Photographs: MT-KOMEX

Like in the car industry, the K2 BASE ON planning software also considers the results obtained through wind tunnel testing – a highly sophisticated procedure to obtain reference values for how the PV systems behave on a flat roof.

PV systems on flat roofs must withstand all wind and snow load forces throughout the lifespan, which is supposed to be 30 years

Like in the car industry, the K2 BASE ON planning software also considers the results obtained through wind tunnel testing – a highly sophisticated procedure to obtain reference values for how the PV systems behave on a flat roof

PV systems on flat roofs must withstand all wind and snow load forces throughout the entire lifespan, which is supposed to be 30 years. To prevent potential damage to the roof membrane, these flat roof systems must also be bolstered by special rubber protection mats which protect the roof membrane. This prevents the PV system from directly rubbing onto the membrane during vibrations when wind forces occur.

The biggest challenge for the PV industry in terms of flat roofs in the last years has, however, been determining the permissible inclination angle of the roofs. By what pitch is the flat roof still considered flat? As flat roof mounting solutions came last to the PV market, there was less feedback regarding the issue. The experience of the last five years has shown that the acceptable and permissible installation on flat roofs may be done on the roof pitch up to 3°.

Installations that had been executed on a pitch bigger than 3° have all shown significant problems by having the PV system being shifted or slipped away from its original position. This was pronounced when coupled with the effects of thermal expansion of the Aluminum, which is the main material of all mounting systems for PV modules. All these new insights have made producers such as K2 Systems advise installers against installations on the roof pitch higher than 3° unless the system can be somehow mechanically fixed into something or leaned against something. However, no universal recipe exists for performing the fixation and the leaning. It must be carefully examined case by case as to how to get this done. At K2 Systems, we have done it several times. However, this is possible with close cooperation with the investor and the local roofing company. Such solutions raise the project to a whole new level, and many other factors must be considered, preventing water leakage being one of them.

K2 Systems

# ORGANELA – THE HARMONY OF CLEAN ENERGY AND ORGANIC AGRICULTURE

Clean energy development is a key moment in efforts to establish energy security and preserve our planet. Due to increasingly affordable construction costs, solar power plants have become the most prevalent renewable energy source. However, these plants are often placed on arable land because of the significant amount of sunlight needed for electricity production. On the other hand, agriculture is equally crucial for a secure future for humanity. To ensure the development of both clean energy and agriculture, the agrisolar concept is being increasingly implemented worldwide.

This year, a small street near Valjevska Kamenica became home to the first agrisolar power plant in our country – the Solar Harvest

This year, a small street near Valjevska Kamenica became home to the first agrisolar power plant in our country – the Solar Harvest. Comprising 48 solar panels with a total capacity of 17.5 kilowatts, this power plant is located on the Organela organic farm, an estate nestled in pristine nature. Pavle Đorđević, the farm owner and our interlocutor, described the project as "a symbiosis between people and nature".

The story of this organic farm dates back to Pavle's childhood when he dreamed of one day having his land where he could create peace and grow fruits and vegetables. He continued to develop his childhood dreams through his studies at the Faculty of Agriculture, and in 2017, he came across



Photographs: Organela

an ad that led him to an abandoned farm, which he turned into fertile and healthy land with a lot of love and effort. A few years later, Pavle produces certified organic fruits and vegetables on his farm.

"We recently added onto our already successful results by installing a solar power plant", said Mr Đorđević.

As he explains, the benefits are numerous. One advantage for the plants is the shade created by the solar panels above them. Installed in this manner, the solar panels protect the plants from excessive sunlight and heat, which can harm their growth, and also shield them from weather events such as hail.

Speaking about the benefits of solar panels, it is important to note that their efficiency depends on the temperature. Higher temperatures reduce the efficiency of solar panels in producing electricity. It is well known that plants naturally cool the space around them, and since they are under solar panels, they cool them down as well, increasing their efficiency. Through photosynthesis, plants absorb water from the soil through their roots. This water is then transported to the top of the plant, where it evaporates through tiny openings on the leaves, a process known as plant evaporation. This way, water evaporates into the air and cools it, which also benefits the more efficient operation of the solar panels.

In addition to promoting crop growth and more efficient solar panel operation, the Solar Harvest agrisolar power plant will also provide clean electricity for the young team working on this farm. This solar power plant is estimated to save 28 tons of carbon dioxide annually.

The young team at Organela, in addition to Pavle, includes agronomists Miloš and Pavle, architect Teodora, neighbor Ljilja, and economist Stefan. On their website, you can find offerings such as green onions, cucumbers, potatoes, zucchini, tomatoes, and other fruits and vegetables. They also offer farm-fresh eggs, organic acacia honey, teas, etc.

The Organela organic farm places significant emphasis on preserving and improving nature by caring for soil, water, and biodiversity. A testament to their dedication is the Organela Lake, which they created by constructing a small dam that allows rainwater, snowmelt, and water from a local stream to be retained. Instead of using drinking water, they use this collected water for irrigation. Furthermore, biomass collected from their land is turned into compost or worm castings instead of being treated as waste.

### THE GARDEN CAN DO WONDERS

The story of the health benefits provided by organic fruits and vegetables becomes complete when they are given to those who need them the most. "The Garden Can Do Wonders" ("Bašta može svašta" in Serbian) is a project launched by the Organela team. Through it, children with cancer staying in Nurdor parent houses receive Organela's best products. One hectare of land has been specifically chosen to grow vegetables and fruits for cancer-stricken children.

The enthusiasm of these young people highlights that Solar Harvest could expand to a larger installed capacity in the next phase. Although such a decision depends on the capacity allowed by the power grid operator, the idea is to expand to parts of the agricultural land unsuitable for cultivation due to poor terrain.

Prepared by Katarina Vuinac


# THE RES SERBIA 2024 CONFERENCE ANNOUNCES NEW INVESTMENTS FOR A GREENER SERBIA

Which wind and solar power plants will participate in auctions for market premiums, how European manufacturers of wind generators, solar panels and other equipment are fighting with competition from China, and what price of electricity we will pay in the coming period – these are just some of the current topics that will be discussed at the RES SERBIA 2024 conference, which is being held on September 23 and 24 in the Vrdnička Kula ethno complex in Vrdnik.

Due to the substantial public interest, the largest regional conference dedicated to renewable energy sources will be held this year as a two-day series of panel discussions focusing on the most important topics of energy transition in Serbia and the region, novelties coming from auction winners, accomplished results, new investments and technologies, integration of renewable energy sources into the electricity market, electromobility and sustainable development in transport and ESG strategies.



Photographs: RES SERBIA


According to data collated by the Electric Power Industry of Serbia (EPS), as much as 36 per cent of electricity was generated from renewable energy sources last year, which indicates that Serbia was among the leaders in Europe.

Small solar power plants are expanding, with more than 3,000 prosumers occupying about 51 MW of capacity registered in the Prosumer Registry. Extensive research recently conducted by the Association Renewable Energy Sources of Serbia, showed that in just one year, the total power generated by prosumers increased almost four times, which speaks volumes about the popularity of producing electricity for one's own needs, both among individuals and companies.

These topics will be discussed at the RES SERBIA 20024 conference, which will answer current issues and launch new topics to be discussed. This year, for the fourth consecutive year, the organizers are bringing together global, regional, and domestic experts in green business. Speakers include key stakeholders in the creation of regulatory frameworks, leaders of international financial institutions, leading bankers, directors and owners of green development companies, electricity traders, and legal experts.

The RES Serbia Association fulfils its mission of connecting key RES stakeholders in the country and the region. Founded in early 2021 with three founding members, the Association is today a representative voice of the industry and a constructive partner for discussions. It also provides support to state institutions, which all contribute to the creation of a positive regulatory framework and a favorable investment environment.

RES Serbia (OIE Srbija) is the only association in Europe with the EBRD, the European Investment Bank, and the World Bank's IFC Group as members. Other members include the Electric Power Industry of Serbia (EPS), which announced that it would invest 5.4 billion euros in RES projects by 2030. Other members include the largest wind and solar electricity producers, contractors and equipment sellers, and regional and global giants.

To assist each other, the RES Serbia members have opted for EPS as an electricity buyer that will provide a balancing service. Furthermore, projects are financed by the EBRD and banks that sponsor conferences. Members sell their wind generators and equipment to other members, while the Association also has designers, contractors, consultants, brokers, and lawyers as its members.

The RES SERBIA 2024 conference will provide a great opportunity for all of them. Last year, almost 500 participants fortified existing connections and established new contacts, all to develop future RES projects that bring us closer to accomplishing a common goal – a greener Serbia.

RES SERBIA

# ACCELERATED GROWTH TREND OF SOLAR CAPACITIES

The prevailing stance in expert circles today regarding solar energy is undeniably positive. Particular emphasis is placed on its achieved technological maturity and the most rapid growth trend compared to other renewable energy sources, making comparisons with the future share of fossil fuels even more compelling.

For the future of energy, an optimal mix that includes wind energy and hydropower, with a carefully measured place for nuclear technologies and moderate hope for nuclear fusion technologies in the more distant future, is indeed being considered.

Energy perspectives on the consumption side must account for the electrification of transport (where feasible) and strong electrification of the heating and cooling sectors and industry. It is essential to focus on reducing energy consumption to improve energy efficiency indicators and possibly due to changes in value systems in what we call the geopolitical West, where there are tentative theories about the need to reduce per capita consumption at this level of development to achieve sector sustainability (degrowthers).

Electricity production perspectives balance consumption perspectives. For instance, in Europe in 2022, there was a production of 5.7 MWh/person, and by 2050, a production of 11.7 MWh/person is expected, dominated by renewable energy sources (RES), primarily solar. As an illustration, the final consumption of all types of energy in Europe was 31 MWh/person in 2022, and it is expected to be 23 MWh/person by 2050 due to the impact of the previously analyzed trends.

A significant characteristic of the energy transition in recent years is undoubtedly the speed of change, especially in the reduction of solar panel and battery technology costs

The concept of sustainable development, which sees environmental degradation as the central problem, is often accompanied by much demagoguery. Its main opponent is fundamentally liberal capitalism, which, with its growing hunger for profit, is practically in a perpetual war with sustainability.

In 2023, 500 GW of RES capacities were built – a record year! Of that, 50 per cent of the new RES capacities were built in China. Almost all analyses show that we will reach the peak use of all fossil fuels before 2030,



Photograph: Unsplash/American Public Power

The growth trend of solar capacities is well illustrated by the fact that 220 GW of new solar capacities were built in solar power plants in 2022, and 500 GW of new solar capacities are expected by 2030

**PROFESSOR NIKOLA RAJAKOVIĆ, PhD, has been teaching courses in power systems at the Faculty of Electrical Engineering in Belgrade for decades. He was the president of the Board of Directors of the Electric Power Industry of Serbia (EPS), the state secretary in the Ministry of Mining and Energy, a consultant to the World Bank, and the manager of numerous projects in the power sector, as well as a mentor for many doctoral dissertations. He has been the president of the Union of Energy Engineers of Serbia since 2004, the leading professional organization in the energy sector, and a consultant on energy projects, predominantly renewable energy projects.**

followed by an accelerated decline in the share of fossil fuels in the energy sector. It is worth noting that, according to analyses, the RES sector will participate with about 80 per cent in the construction of new energy capacities in 2030, with solar technologies dominating with more than 50 per cent share. The growth trend of solar capacities is well illustrated by the fact that 220 GW of new solar capacities were built in solar power plants in 2022, and 500 GW of new solar capacities are expected by 2030.

Decentralization refers to electricity production from small, geographically distributed renewable energy sources. Decentralization (distributed production) also brings

Photographs: (Rajaković) courtesy of Nikola Rajaković; (bottom) Unsplash/Mariana Proenca

elements of democratization to the sector by dismantling monopolies of large energy giants. This segment is particularly significant for solar technologies, with solar panels installed on the roofs of family homes, public institutions, parking lots, supermarkets, and factories. In the future, decentralized production of all types of energy is expected to meet almost a third of total energy needs, with solar technologies again standing out as dominant due to their modularity, low cost, environmental friendliness, and potential for installation on vertical facades, car roofs, and numerous unconventional solutions. Centralized production remains dominant (large power plants) but in synergy with decentralized production, which practically does not burden high-voltage transmission networks, forming an optimal hybrid mix.

Agrosolar, or the simultaneous use of land for electricity production through solar panels and food production or biomass, is a significant segment of solar technology applications. The use of agrosolar in viticulture has already proven remarkably successful, where grape yields under solar panels, which have adjustable angles, are somewhat reduced, but accelerated airing of the vines after rain minimizes the development of fungal diseases, achieving optimal sunlight conditions (not too much, not too little sun), leading to a win-win situation with additional income from the produced electricity.

For the development of large solar projects, it is crucial to successfully solve three parts of a complex puzzle: land (with the labyrinth of urban project development), grid connection (with realistic and conservative limitations imposed by grid operators), and the power purchase agreement (PPA) for the produced electricity (ensuring project bankability).

A significant characteristic of the energy transition in recent years is undoubtedly the speed of change, especially in reducing solar panel and

Agrosolar, or the simultaneous use of land for electricity production through solar panels and for food production or biomass, is seen as a significant segment of solar technology applications

battery technology costs. It is essential to note that hybrid solutions (combining solar power plants with powerful batteries at the same location as one balancing group) are very competitive today.

A key change that will occur in the coming years is the increased variability in production. In this context, the integration of RES is a central issue for the profession. Today, experts believe it is possible to operate a system with 100 per cent renewable energy sources, i.e., to run an energy system completely decarbonized. This task includes short-term and long-term aspects of balancing production and consumption, with the primary goal being the optimal sizing of energy storage. It has been shown that broad integration of renewable sources is too expensive if done only within the electricity sector. Therefore, the link with the transport sector (storage in electric vehicle batteries), the link with the heating sector (converting excess electricity from solar and wind power plants into heat in large

reservoirs), the link with reversible hydroelectric plants as a classic technology for smoothing out production and consumption irregularities, and the link with compressed air storage are important. Finally, converting excess electricity from RES into green hydrogen in electrolyzers and then into ammonia as a strategic energy



Photograph: (top) Unsplash/Andreas Gucklhorn; (middle) MT-KOMEX

a concept based on control signals from a superior center where the consumer was passive. In this context, digitalization, i.e., the broader concept of introducing smart grids or smart infrastructure, is seen as a sine qua non of the energy transition. The first link in network digitalization was the smart meter. Today, downstream of the meter, there are smart devices and home appliances equipped with IP (Internet Protocol) addresses participating in demand response (an expanded version of the Internet of Things), and upstream of the meter at the level of transformer stations and facilities, there are concentrators and sensors, all tasked with monitoring and automating the power grid. The associated software enables applications of a technical-technological nature, as well as commercial and other applications. Two-way communications are a prerequisite for a smart grid,

carrier stands as an important option for a successful energy transition.

There are about ten more technological options for balancing, but the cheapest is demand response through the active contribution of each consumer in managing consumption. Demand management was implemented in previous decades as and two networks can essentially be followed in smart infrastructure: the conventional energy network and the superimposed communication network. This opens up unprecedented possibilities for integrating RES into the power system, and practical solutions have already gained broad commercial appeal.

The construction of large solar power plants in Serbia at this moment gives additional impetus to the energy transition. The key influential factors are the low average costs of electricity production in solar power plants (estimated to be at least three times lower today than the exact costs for a new thermal power plant, with a correct consideration of the expenses due to $CO_2$ emissions and external costs – primarily public health costs) and the relatively high electricity price on the market.

Since it is evident that at least 1,200 MW of installed capacity in old thermal energy capacities must be gradually shut down in the next five years, it follows that replacement capacities in renewables of about 2,000 MW in the wind and about 3,000 MW in solar power plants are necessary.

It is also the right time to accelerate the energy transition process in Serbia and recognize that this is an opportunity to ensure more sustainable growth and development through a faster transition to RES. Therefore, increasing electricity production from renewable sources, along with measures to improve energy efficiency and decarbonize energy production and consumption, represents the backbone of the energy transition and obligations that Serbia has undertaken towards the outside world.

Therefore, solar projects in our conditions have the lowest production costs of new green MWh, are built the fastest, and have the smallest environmental and broader social impact. Additionally, large installed capacities can be achieved through a series of larger and medium-sized projects that would be territorially distributed to reduce simultaneity in production and pressure on the grid. Another motivation for intensifying the construction of solar power plants lies in the fact that Serbia lags behind developed countries by almost two orders of magnitude in installed capacity per capita in solar energy!

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## Conditions and an example of an energy efficiency loan, disbursed in collaboration with EBRD and GEFF

| | Loan amount in RSD | | | |
|---|---|---|---|---|
| | RSD 500.000 | | RSD 1.000.000 | |
| | fixed | variable | fixed | variable |
| NIR | 9,00% | 5,2%+3m Belibor | 9,00% | 5,2%+3m Belibor |
| **EIR** | **9,53%** | **14,13%** | **9,54%** | **12,88%** |
| Maturity | 71 | 84 | 71 | 84 |
| Loan processing fee | 0,00% | 0,00% | 0,00% | 0,00% |
| Monthly installment | 9.139,31 | 8.573,80 | 18.278,62 | 17.147,60 |
| Amount the client repays at the end of the maturity period | 648.891,21 | 720.198,93 | 1.297.782,48 | 1.440.397,96 |

This example applies to earnings exceeding RSD 60.000

**4. Complete the works and install the chosen technology(ies)**

**5. Register with the Verification Management System and submit an application form to receive your refund**
This is done through the Verification Management System at www.ebrdgeff.com/serbia

**6. The GEFF Team will verify your investment**
This means that the GEFF Team will review your documentation and make a field visit if necessary to verify your investment.

**7. The bank will deposit your refund directly into your account**
You are free to dispose of these funds as you wish.

Loan type: dedicated household loan • Loan currency: RSD • Indexing criteria: none • One-off loan processing fee: 0.00% • Collateral: for loans up to RSD 600,000: no promissory notes or Attachment of Salary; for loans between RSD 600,000 and RSD 3,500,000: a promissory note and an Attachment of Salary are provided; for loans between RSD 3,500,000 and RSD 5,850,000: a promissory note, Attachment of Salary and mortgage are provided • Additional expenses: 2 promissory notes (RSD 50/each) • Credit Bureau Report (RSD 246) • Total Package Account maintenance fee (RSD 595) • Minimum earnings: RSD 36,000 • Maximum loan maturity period: between 12-180 months – Maximum amount: between RSD 120,000 and RSD 5,850,000 • This example entails the transfer of earnings to an account held with ProCredit Bank, with the use of the Total Package account • For this example a 3m Belibor of 5.69 was applied (as at 1 June 2024) • Disbursement in accordance with the Loan Agreement, to the dealer's account • The aforementioned conditions are of an informative nature

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# ECO GYM – NURTURING THE HEALTH OF PEOPLE AND NATURE

When people neglect to take care of their health, they also distanced themselves from nature. In the same way, neglecting nature inevitably endangers a person's health. In a world where the awareness of this unbreakable bond is declining, there are individuals who, thanks to their knowledge and passion, do not allow this bond to fall into oblivion. During the pandemic and isolation, when we seemed to be the furthest from nature, Marko Ćirić, professor of sports, devised a way to reconnect us with nature. Marko comprehensively described the idea that brings multiple benefits in one sentence – "This is a circular economy project where, with the help of volunteers, we clean rivers, collect wood waste and give it a new life through a socially useful Eco gym".

As a professor of sports and owner of a raft on the Sava River for over 40 years, he often organized river cleaning campaigns, but he did not know what he could do with the collected wooden waste. They used the separated waste to create decorations for the coast but without a clear picture of how they could use it. As Mr Ćirić explains, he focused his time during the pandemic on research, which helped him find the connection between his primary occupation and his love for the river. After devising the initial idea, he assembled a five-member team to implement the concept together with him.

"We had no idea how many challenges would be ahead of us. In August 2023, we became a part of the UNDP EU project for the Green Agenda in Serbia, during which a public call to submit innovative solutions related to the circular economy was launched. With their help, especially Ana Mitić and Tatjana Jovančević, we started to develop a project", says our interlocutor.

Some of the challenges the team faced were the technical drawings and statics of all devices, the acquisition of the necessary documentation, and the design of the gyms. They paid special attention to safety by obtaining safety certificates from the IMS Institute, patenting, securing copyright rights, promoting, and other related activities.

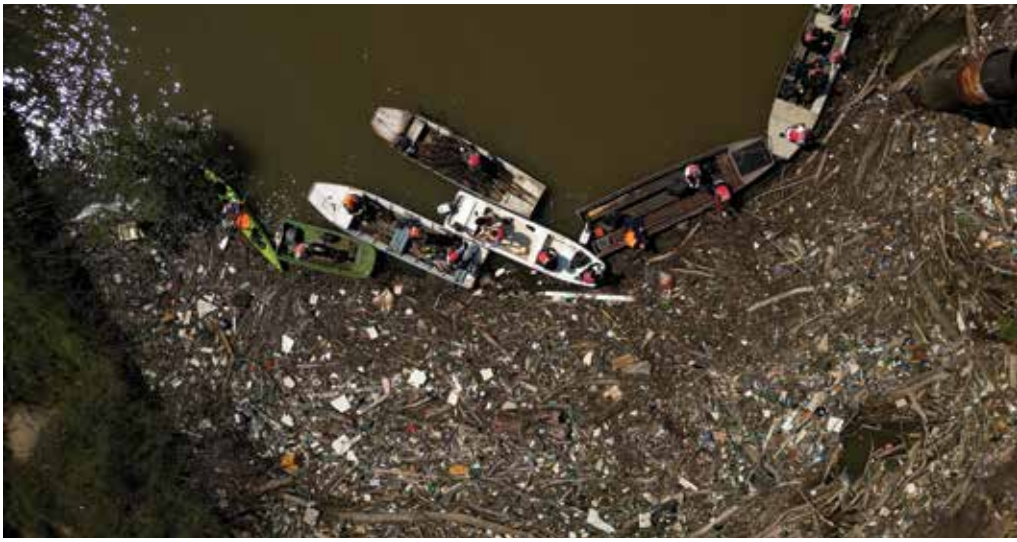
The entire process of creating an Eco Gym consists of several stages. Depending on the chosen location, the team finds a river nearby and conducts a cleaning campaign at least once a month. The collected waste is sorted, and most is used for recycling. Branches and trees are transferred to the dryer and workshop. PET packaging, which is also collected, is sorted and taken to recycling centers, and the collected bottled caps are transported to the Čepom do Osmeha organization in Novi Sad. About 10 per cent of the waste wood is used to make the equipment, which is then coated, while the rest is used to make a floor



Photographs: *Eco gym*

### THE IMPORTANCE OF CLEANING CAMPAIGNS

By cleaning coasts and rivers, we raise people's awareness of environmental protection. At the same time, we prevent the accumulation of wood and other waste, which reduces the likelihood of creating breeding grounds for reptiles and mosquitoes. Perhaps the most positive thing is that waste wood is used as a building element.



for the gym. In this way, the entire process of circularity is completed, with no leftover waste and where each part has its purpose. After all the segments are made, they are transported to the selected location and assembled into the Eco Gym, which consists of 13 pieces of equipment. Eco Gym has equipment to exercise the whole body, designed so that several muscle groups can be worked on one device, and you can add extra weights. This gym is intended for a wide range of users, from high school students to senior citizens. Some of the equipment available includes eco squat, eco deadlift, eco bench, eco decline, eco stretch and others.

So far, three Eco Gyms have been built and installed. In cooperation with UNDP, the world's first gym of this type was opened in Vršac in June 2023. Antoine Avignon opened the gym in front of the European Union, the Embassy of the Kingdom of Sweden, the UNDP delegation, and representatives of the Vršac government. The other two gyms are located in Zlatibor and Sokobanja.

## Education and the development of environmental awareness are the bottom lines of the Eco Gym

"We are trying to make a family brand out of cleaning campaigns and to motivate as many people as possible to join us through education and our good example. In the past year, more than 500 people have participated in river cleaning campaigns, and we managed to provide boats and safety vests for all the participants", says Marko.

The users' reactions to the Eco gym have exceeded their expectations, and the whole idea is going in an excellent direction, as seen in the many photos that satisfied users sent to them.

Students of the Faculty of Sports and Physical Culture, recreationists, teachers, ambassadors of the EU countries, embassy workers and nature and sports lovers have joined river cleaning campaigns. During the last cleaning campaign, they wanted to unite whole families, focusing on raising awareness among children by having an educational workshop. The children demonstrated that they know and love nature despite having little contact with it. That's why Marko launched three more projects of a similar nature, aimed at children and young people, because, according to him, only by educating them can we have a shot at a better future. Eco children's playgrounds, which he is currently working on, will serve both sports and educational purposes. These projects also include entire families because they are the nucleus of a healthy society.

## The entire process of creating an Eco Gym consists of several stages

Prepared by Katarina Vuinac

# NEWS FROM THE COUNTRY AND THE WORLD

## ETHIOPIA IS THE FIRST COUNTRY IN THE WORLD TO BAN THE IMPORT OF FOSSIL FUEL VEHICLES

Although many countries have announced targets for 2030 or 2050 for banning the import and production of conventional vehicles, Ethiopia is the first country in the world to ban the import of fossil fuel-powered cars and switch entirely to electric vehicles.

As reported, in late January this year, the Ethiopian Ministry of Transport announced that a ban on the import of conventional vehicles would come into effect, while the Government of Ethiopia announced a plan to import close to half a million electric cars and install over 2,000 charging stations in the next 10 years.

Although the number of registered motor vehicles in Ethiopia is relatively small (about 1.2 million in a population of 126 million people, according to the 2020 data collated by the country's Ministry of Transport), Ethiopia is determined to completely switch to environmentally friendly vehicles and thereby reduce traffic-generated pollution.

An additional reason for this transition lies in the fact that Ethiopia imports about 6 billion US dollars worth of fossil fuels annually, half of which goes to fuel vehicles. On the other hand, the country has extremely cheap electricity (the price of one kWh is about 1 US dollar for individual consumption and about 2 US dollars for industry), so switching to electric vehicles is also a money-saving measure.

Milena Maglovski

## INDIA IS THE THIRD COUNTRY IN THE WORLD IN TERMS OF SOLAR ENERGY PRODUCTION

According to the latest global electricity survey of 80 countries published by the Ember think tank, India now occupies third place in the world regarding solar power generation, behind China in first place and the United States in second place.

In 2023, solar growth in India accounted for as much as 5.9 per cent of global solar growth.

The Institute for Energy Economics and Financial Analysis (IEEFA) has published a report on new energy capacity in India for the first quarter of 2024. According to the POWERup report, India added a record 13,669 megawatts to its energy mix from January to March this year, and renewable energy sources accounted for as much as 71.5 per cent of all new capacity.

Solar projects dominated among renewable energy sources with 62.1 per cent of new energy capacities, i.e. 8495 MW.

Wind energy accounted for 8.4 per cent of added capacity in the first quarter of 2024, while the country also expanded its nuclear capacity by 700 MW.

Investments in renewable energy sources decreased by 58.9 per cent compared to the first quarter of 2023. Still, the Indian government has confirmed that the RES sector will attract investments worth about 16.5 billion dollars.

India intends to add 40.7 GW of new renewable or nuclear power to its energy mix each year to achieve 500 GW of non-fossil capacity by 2030.

Although coal capacity also increased in the first quarter of 2024, the overall share of coal in India›s energy mix fell below 50 per cent for the first time. The Indian government intends to maintain this trend so that in 2030, electricity production from fossil fuels will not exceed 50 per cent.

Milena Maglovski



Photographs: (left) Unsplash/Nabeel Syed; (right) Unsplash/VD Photography

## IS IT POSSIBLE TO COMBINE THE CHEMICAL INDUSTRY AND CIRCULAR ECONOMY?

The chemical industry is an important segment of the global economy because it employs more than 15 million people worldwide and has global annual revenues of 5.7 trillion dollars, according to data from the Planet Tracker analytical centre.

However, this sector is experiencing increasing pressure to make its practices sustainable as the chemical industry is one of the biggest emitters of carbon dioxide and one of the biggest environmental polluters.

Many companies have turned to renewable energy sources to reduce their carbon footprint. Still, the question remains: how can we introduce the use of sustainable raw materials to produce chemicals?

Scientists from Griffith University in Australia are one step closer to a solution that will transform the polluting chemical industry into a sustainable one, using catalysts and waste resources.

Professor Karen Wilson explains that catalysis has historically played a key role in transforming fossil resources into basic fuels and products, creating an opportunity for a revolution in the chemical industry.

Scientists are looking for catalytic processes that will allow them to harness sustainable resources like organic waste, hoping to move the chemical industry from a linear to a circular economy.

"Catalytic processes could minimize reliance on limited fossil fuels and significantly curb $CO_2$ emissions by using agricultural, municipal and plastic waste as feedstock", said Professor Adam Lee.

Milena Maglovski

## CAN HEAVY INDUSTRY RELY ON SOLAR ENERGY?

The industrial sector is responsible for a quarter of greenhouse gas emissions. Therefore, it is necessary to develop new materials and processes that will be environmentally acceptable and, at the same time, economically competitive with coal, say experts from the Center for Strategic and International Studies.

Swiss researchers discovered a new environmentally friendly source of thermal energy for heavy industry. Solar energy can generate over 1,000°C, which is necessary for steel melting, cement production, and other uses.

Emiliano Casati, head of research at the Federal Institute of Technology in Zurich, says their concept uses synthetic quartz to capture solar energy, a process known as the thermal capture effect.

Researchers have built solar receivers that concentrate and generate heat using thousands of mirrors to track the sun. The thermal capture device consists of a synthetic quartz rod to which an opaque silicon disc is attached as an energy absorber. When they exposed the device to an energy flux equivalent to the light from 136 suns, the absorber plate reached the temperature of 1,050°C, while the temperature at the other end of the quartz rod remained at 600°C.

"Previous research only managed to show the thermal trap effect up to 170°C. Our research has demonstrated that solar thermal capture works not only at low temperatures but well above 1,000°C. This is crucial to demonstrate its potential for real-world industrial applications," said Mr Casati.

He added that we needed to decarbonize energy in general to tackle climate change.

"People tend to only think of electricity as energy, but in fact, about half of the energy is used in the form of heat", he added.

Milena Maglovski

Photographs: (left) Unsplash/Freepik; (right) Unsplash/Karan Bhatia

## SATELLITES IN THE SERVICE OF ECONOMIC AND ENVIRONMENTAL OPPORTUNITIES

Satellites often inspire me to write about them. Perhaps the reason for the inspiration is that they seem like a long-established concept, that they have always been here and that there is nothing unusual about them. However, how much do we know about their capabilities? It is clear that they orbit our planet, record it and provide us with photos, Google maps and more, but what other benefits do they offer?

I have already written about solar satellites and research on how they can produce solar energy in space and send it to our planet, even 50 per cent more efficiently than solar power plants on Earth. Recently, Google and the Environmental Defense Fund launched a satellite called MethaneSAT, which I also wrote about earlier. To remind you, this satellite's mission is to locate and measure emissions from oil and gas operations around the planet in a significantly more advanced way than existing satellites have done so far. This technology also offers weather monitoring, which is especially important in light of climate change because it enables early warnings of weather problems.

The World Economic Forum published a report on how Earth observation (EO) can significantly contribute to economic and environmental development. EO normally contains data about the Earth, which is collected through satellites and sensors.

Speaking of economics, some predictions are that by 2030, the economic opportunity provided by Earth observation insights will exceed $700 billion. On the other hand, EO provides information that can reduce greenhouse gas emissions by more than two gigatons per year – expressed in carbon dioxide equivalent. The potential is even more significant if we consider that this number is calculated based on the five leading EO applications that directly impact these

emissions, but many can indirectly affect the reduction.

Economic and environmental conditions are not mutually exclusive. On the contrary! As a simple example, we can mention the monitoring of weather events. From an environmental point of view, long-term monitoring allows scientists and the public to become better acquainted with climate change around the world, thus developing awareness of this problem and finding solutions to it, depending on the changes from region to region. At the same time, early warnings of climate and natural disasters can reduce economic damage but, more importantly, save human lives.

In terms of ecology, EO will show its potential, especially from 2024 to 2030. Here, we can mention the increasingly stricter measures in the fight against emissions and the much-talked-about Cross-Border Carbon Adjustment Mechanism – CBAM. Namely, this mechanism entails reporting on emissions and other measures that require emissions reduction. Satellites and artificial intelligence are making it easier to trace the source of these emissions, helping to stop non-compliance across the planet.

Thanks to these satellites, such problems are monitored and ensure the monitoring of fires, illegal deforestation, surface water quality, microplastics in the oceans, and more.

Scientists say that satellites' potential is still untapped, which optimistically indicates that more news about this technology will inspire me to write another article on cooperation between satellites and ecology in the coming period.

Katarina Vuinac



Photographs: (left) Unsplash/NASA; (right) Pixabay

## OIL SPILLS POSE A BIGGER THREAT TO FRESHWATER ECOSYSTEMS

Oil spills are a major environmental problem that occurs every year worldwide, affecting oceans, seas, rivers, and lakes. Although the world is familiar with the issues and changes in salt water, the effects oil spills have on freshwater are less understood.

A team of researchers from the American Chemical Society simulated oil spills in rivers and then studied what happens chemically to the oil in freshwater environments such as rivers and lakes. They collected water samples at various points during the nearly two-month experiment to analyze the changes.

We know some of the basic problems that oil creates when it is poured into water, such as the darkening of the surface of the water that it creates due to its structure, and it disrupts photosynthesis in plants since they cannot get enough sunlight. Of course, the quality of the water decreases, and the poisoning of animal life is also possible. The river vegetation, diverse river banks and downstream water flow often make cleaning difficult, so it is necessary to form a dam in a suitable location to "catch" the oil spill. However, research has shown that these are not the only problems oil spills cause in freshwater ecosystems.

Research has shown that as oil ages in freshwater, it undergoes chemical changes that lead to the formation of new compounds. These compounds get more oxygen atoms, making them more stable in water but also more harmful than in the sea and ocean. Oxygen-rich compounds, especially sulfur oxide derivatives, may have more impact on aquatic life.

Last year, over 30,000 liters of oil were spilt near the village of Čelarevo in Serbia, as a result of which river beaches were closed.

One of the significant cases of oil spills in the river happened in Russia a few years ago, when a company was fined with the biggest penalty on record for causing an environmental disaster. This occurred in 2020 when about 21,000 tons of diesel leaked from the company's tank into the Ambarnaya River in the Arctic north of Russia. The contamination affected the river and the surrounding area, with the pollution spreading to Lake Pyasino, which flows into the Kara Sea. In total, the oil contaminated an area of 350 square kilometers.

A significant oil spill also occurred in Ecuador in 2022. The incident was caused when heavy rains triggered a landslide, after which the oil pipeline was damaged due to falling rocks. The oil contaminated the Coca River and almost two hectares of the protected area of the National Park.

In all, 2023 saw ten significant oil spills, one of which was large-scale, with over 700 tons of fuel oil spilled in Asia in February. The remaining nine incidents involved smaller spills, which occurred around the world—four in Asia, two in Africa and Europe, respectively, and one in the Americas. These developments add to the annual average of around 6.8 major spills, which is in line with the averages from the previous decade, according to ITOPF data.

Milica Vučković

Photograph: Unsplash/Riley

## HOW CAN NUCLEAR TECHNIQUES IMPROVE FOOD SAFETY?

At the recent International Symposium on Food Safety and Control, organized by the International Atomic Energy Agency (IAEA) and the Food and Agriculture Organization of the United Nations (FAO), nuclear technologies were presented as an asset to help fight hunger, reduce malnutrition and improve sustainability.

On the occasion, Qu Dongyu, Director-General of FAO, pointed out that it is essential to control food safety from the beginning - from soil and water to agricultural practices - while highlighting the role of nuclear technologies as crucial in setting scientifically based standards for food.

When asked what nuclear techniques are, the answer is that they are methods based on the principles of atomic physics and technology, and they can be applied for various purposes - from medicine or industry to agriculture.

Nuclear technology has contributed to detecting, controlling and preventing diseases that cross borders, as well as zoonotic diseases, that is, diseases transmitted from animals to humans.

Radiosterilization can be cited as one of the examples of nuclear energy use. Radiosterilization uses ionizing radiation and is a form of energy produced by nuclear reactions. Radiosterilization removes bacteria from food, simultaneously extending its shelf life. Furthermore, the productivity of crops is improved, which reduces the use of harmful pesticides.

One of the types of high-energy ionizing radiation, which is a result of the nuclear process, is gamma radiation. Small fruit flies are used in this context as an example. Fruit flies cause significant problems for farmers worldwide, attacking fruit plantations and thus causing billions of euros in damage. The so-called sterile insect technique is used in the fight with these insects.

This technique involves the sterilization of male fruit flies by gamma radiation. In this way, they can no longer reproduce, and after sterilization, they are free to return to nature.

Gamma radiation has other benefits, too. Scientists are constantly searching for new varieties of plants that can be used for cultivation and human nutrition. To create new species or improve existing ones, scientists can change the genetic material of plants, which is done by causing mutations. Natural mutations rarely occur because they arise spontaneously when an error occurs in the so-called DNA copying process during plant reproduction. However, this process can be made more frequent and faster by using gamma radiation. More precisely, this type of radiation causes mutations in the DNA of plants and thus, new varieties are created. It should be noted that this can be done taking into account adaptation to climate changes, but also to different conditions in the natural environment where the plants are grown. The resulting plant varieties are more resistant to diseases, droughts and other challenges.

A third example of the benefits provided by nuclear techniques is the possibility of measuring and controlling soil moisture and the nutrients found in it, which are crucial for plant growth. Namely, the radioactive nuclides that remained in the soil after nuclear events facilitate the measurement of soil erosion or, for example, the evaluation of the sedimentation rate. This way, information about soil health and its changes over time is obtained.

Katarina Vuinac



Photographs: Unsplash/Wim van 't Einde

# THE POTENTIAL AND IMPACT OF SOLAR PANELS ON WATER SURFACES

Solar energy is developing faster than all other renewable energy sources. There are different types of panels and many ways in which they can be installed. Ground and roof solar power plants are still the most popular ones.

Solar power plants that are installed on water surfaces, the so-called floating solar power plants, are increasingly becoming a hot topic of conversation. Namely, these are solar panels that are installed on floating structures, mostly on calmer bodies of water, such as lakes or those near dams. Anchoring systems are added to them to ensure the stability of the installed panels.

Research has shown that solar power plants built in this way have several advantages over those, one might say, usual ones, that is the ones installed on the ground and roofs. Namely, experts in this field say that solar panel operations are affected by the air temperature because when the panels are heated, their efficiency decreases. This is precisely where the advantage of water solar panels lies, as water provides a natural cooling effect. The data shows that the temperature of the solar positioned on a body of water can increase their efficiency by 15 per cent.

Another reason why the presence of water increases their effectiveness is the albedo effect. More precisely, this effect refers to the ability of a certain surface to reflect light back and as we all know, water surfaces reflect sunlight more strongly than land ones. Thanks to this feature, the sunlight is directed back to the solar panels, which increases its amount and thus simultaneously improves the efficiency of electricity production.

However, there are also a few drawbacks that we should mention. Such projects are mostly large-scale, which means that if someone wants to produce

electricity for their own needs, such as for their home, it is more practical to install them on the roof. Furthermore, not all bodies of water can be used for solar power plants, because they need to be calm. Also, the cleaning of the panels is not that easy, as it often requires more financial resources and special equipment. The panels need to be clean to be efficient.

Another questionable feature is the impact that such power plants have on the aquatic ecosystem. Some studies have shown that they can have positive effects. Given that they create a shading effect, i.e. create a shadow on the surface on which they are placed, solar panels contribute to lowering the water temperature and thereby reducing the degree of its evaporation. This is especially important in areas that are arid and where there is a risk of water shortage. The so-called algal bloom, which can cause negative consequences for the aquatic ecosystem, occurs due to the excessive availability of sunlight and nutrients, which are reduced by the presence of floating solar power plants.

However, if such power plants are installed without special precautions, they can hurt the living world. As mentioned earlier, the presence of the panels affects the temperature of the water as well as other characteristics, thus changing the exchange of oxygen and carbon dioxide, wind effects and the amount of sunlight that penetrates below the surface. To keep these changes under control, there is a limit on the degree of coverage of water areas. Other rules should also be noted, such as that floating solar systems should be installed at least 40 metres from the shore.

Katarina Vuinac

Photographs: (left) Unsplash/Markus Spiske; (right) Wikimedia/SolarWriter

## FRENCH MUNICIPALITY PLANS TO BUILD A SOLAR POWER PLANT IN A CEMETERY

An unusual solar venture will soon be realized in the French municipality of Saint-Joachim, more precisely in the municipal cemetery.

As reported by the French media, the municipality intends to install 5,000 solar panels on the canopies above the graves by 2025.

The project in the municipality of Saint Joachim was launched in 2021 as a solution to the problem of frequent flooding in winter. Solar panels are an ideal way to make additional use of the 5,000-square-metre area.

The solar power plant above the cemetery will be commissioned in the summer of 2025, and around 4,000 municipal residents can use the green energy generated by these panels.

The municipal authorities completely finance the project, while the citizens' association Brier'energie will handle its administrative and legal affairs.

The president of the association, Éric Broquaire, told Ouest-France that the association's role was to connect producers, power distribution grids and consumers.

For electricity to be fairly distributed to all households, the software will have to process 1,400,000 pieces of data per month, that is, to calculate the production and consumption of electricity for each household every 30 minutes.

"Once the plant is up and running, everyone will get their share of power, which will be listed on their bills," Broquaire added.

Certain opposition representatives harshly criticized the construction of a solar power plant above the cemetery because "the profitability of the solar power plant is placed above respect for the deceased," but this did not thwart the project's implementation.

Milena Maglovski

## 2024 OLYMPIC GAMES – SUSTAINABILITY IN EVERY ORGANIZATIONAL SEGMENT

This year, Paris will host over 10,000 athletes and numerous visitors for the 2024 Olympic Games. An event of this scale requires large resources and energy.

The organizers implemented a responsible purchasing strategy, defined in 2019. Thanks to this strategy, 90 per cent of the six million elements used will be used by suppliers and partners after the Games. In comparison, the Organizing Committee of the Olympic Games will handle the remaining 10 per cent.

When procuring all the required elements – such as seats for spectators, tents, beds, sports equipment, etc. – the organizers gave preference to suppliers that meet several environmental standards.

Also, over 33,000 $m^2$ of sports flooring will contain about 35 per cent recycled materials and be 100 per cent recyclable.

The 2024 Games have pledged to reduce single-use plastics by 50 per cent compared to the 2012 Games held in London.

### Other measures for reducing the ecological footprint of the Olympic Games

Instead of buying new sports equipment, the 2024 Olympic Games have prioritized renting. Of the two million required items, three-quarters will be borrowed from sports associations. 75 per cent of electronic equipment, as well as 100 per cent of stands, tents, and bungalows, will also be rented.

Another environmental measure, entails using 95 per cent of existing buildings and infrastructure, will be applied at the Games in Paris.

The Olympic Committee said that the Games are structured to use the existing public transport network, and more than 400km of new bicycle paths.

Furthermore, the measures for responsible food management include doubling the proportion of plant-based ingredients in meals and sourcing ingredients from local producers.

Milena Maglovski



Photographs: (left) Unsplash/Soren H; (right) Unsplash/Hansjörg Keller

# SCHNEIDER ELECTRIC EMPOWERS BUILDING OWNERS AND OPERATORS TO ACHIEVE NET ZERO CARBON GOALS WITH ECOSTRUXURE™ ENERGY HUB

Facility managers must be empowered to monitor energy usage and emissions in real-time. Yet, the vast majority of electrical assets in buildings are not digitally connected, limiting the visibility of energy usage.

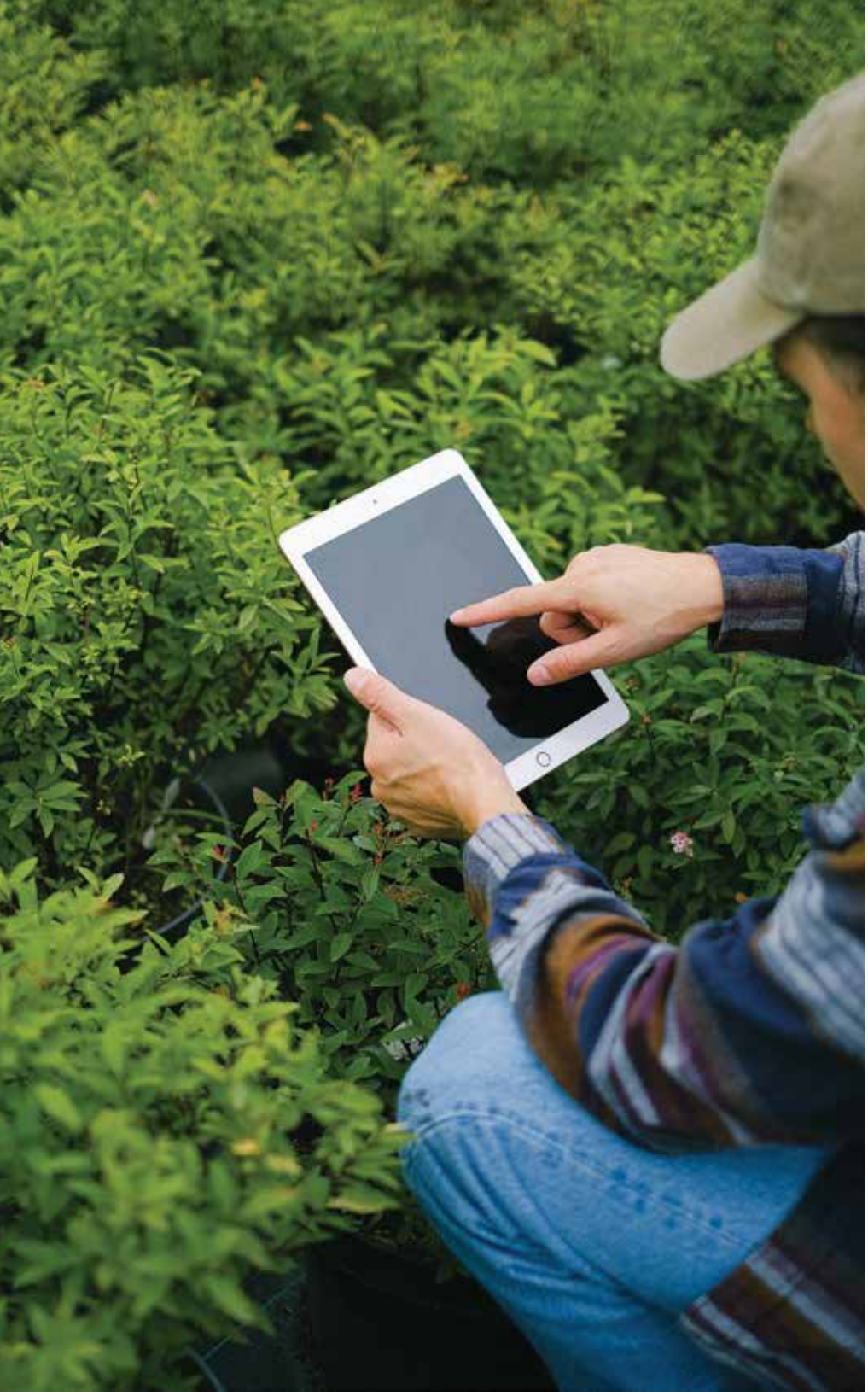
EcoStruxure™ Energy Hub provides visibility into energy usage, costs and performance, and energy-saving recommendations – all in an intuitively designed package that is simple to install, configure and use. It makes energy management easy and secure, all via a smartphone app. "EcoStruxure™ Energy Hub enables facility managers to automatically collect, store, and visualize energy data while generating reports on energy consumption – whether they manage a single building or a portfolio of buildings.

Implementation of EcoStruxure™ Energy Hub helps building owners comply with building energy codes and creates transparency to help drive energy-efficient and sustainable behavior. The solution encourages accountability of tenants by providing a simplified allocation of building energy usage, billing configuration and report generation. Analytics helps to develop deep insights into waste reduction and operational improvements, including energy savings tips. Energy optimization helps organizations drive continuous energy improvement in building operations without investing in expensive, sophisticated, on-premises automation systems. The software enables you to monitor energy infrastructure in real-time emailing or messaging notifications. It provides visibility into energy usage, records, responds and accelerates total energy consumption issue solving.

Schneider Electric


To find out more about EcoStruxure™ Energy Hub solution, QR CODE

Photographs: *Schneider Electric*



# INNOVATIVE APPLICATION OF INFORMATION TECHNOLOGIES IN AGRICULTURE

BioSens Institute, Institute for Research and Development of Information Technologies in Biosystems, is a pioneer in the digital transformation of agriculture in Serbia. Investigating the scientific and technological boundaries of the innovative application of IT in agriculture, the Institute aims to provide the domestic and global agricultural sectors with superior digital solutions to achieve higher yields with less investment. We spoke with Oskar Marko, PhD, Assistant Director for Innovation and Industrial Collaboration at the BioSens Institute, about the advantages of the AgroSens platform, the functioning of the Digital Village in Mokrin, how the dim.rs portal affects the improvement of the environment, how digitization can increase income, why is Institute important for young researchers and whether they participate in projects funded by the European Union.

**Q: Could you tell us how the AgroSens platform, i.e. the digital service for farmers, operates?**

A: AgroSens is a platform developed to provide farmers with quick and straightforward access to data, but it also provides the community with the top scientific results accomplished by the BioSens Institute in artificial intelligence, satellite image processing, and sensor network development. The platform includes many modules, including weather forecasts, processed satellite images, a digital field



Photograph: Pexels/Anna Shvets

One of the examples of progress in digitalization is the AgroSens platform, which over 20,000 farmers use. If we add up the total area managed by these farmers, it comes up to a quarter of the total arable land in Serbia

book, and more. Based on this data, it is possible to gain insight into the state of the crop and make decisions based on facts on the ground, which ensures high yields and reduces risks.

**Q: What was the idea behind establishing the Digital Village in Mokrin? How does the project work in practice?**

A: The central idea of the Digital Village was to take the entire arsenal of digital technologies available to us and use the example of a village to show their impact on production and the community as a whole. As part of this project, lectures were given to farmers; fields were scanned with drones, sensors and weather stations were installed, and everything was implemented with the support of experienced agronomists. Local farmers have demonstrated a high degree of professionalism, interest and openness and judging by the feedback, digital technologies have helped them to gain insight into the condition of crops and to determine the right moment for the application of agrotechnical operations – the application of pesticides, fertilizers and more – which, in turn, has helped them to optimize the use of inputs and ensure high yields.

**Q: How would you rate the progress of digitalization in agriculture? How much can digital transformation increase revenues and help farmers to achieve higher yields with less investment?**

A: One example of progress in digitalization is the AgroSens platform, which over 20,000 farmers use. If we add up the total area managed by these farmers, it comes up to a quarter of the total arable land in Serbia. This is a validation that our farmers have recognized the importance of digital transformation and that we can expect an increasing impact of modern technologies in agriculture in the future. Also, irrigation opti-

**OSKAR MARKO, PhD is the Head of BioSense's Center for Information Technologies and the Assistant Director for Innovation and Cooperation with the Economy. His research focuses on applying advanced machine-learning methods and evolutionary algorithms in agriculture. He attended the third year of undergraduate studies at City University in London, where he defended his graduate thesis in signal processing. Marko led the BioSens team that developed novel big data algorithms, earning the Institute first place at Syngenta's Crop Challenge and CGIAR's Inspiring Challenge. He is actively involved in many projects from the Horizon 2020 programme, including Antares, Cybele, Dragon and Flexirobots, and projects implemented with the World Bank, insurance companies and NASA. Mr Oskar co-founded the Cropt Company, which was declared the best European AI startup in the competition of 180 companies in the Reach incubator.**

Photographs: (bottom) Pixabay/Albrecht Fietz; (Marko) courtesy of Oskar Marko

mization systems and many other sensors, such as Plant-O-Meter and soil moisture sensors, are patented and licensed and are available in the market. Solutions for agricultural production are not the only solutions we have. Agricultural producers are automatically evaluated thanks to the project we are implementing with the World Bank. They are granted loans much more easily, which, in turn, facilitates their greater access to finance to start production and ensures higher yields and profits.

**Q: What makes the Institute appealing to young researchers? How do you encourage the development and progress of your employees?**

A: We had many examples of researchers returning to Serbia from abroad precisely because of BioSens and foreigners who came to work here. We also have French, Brazilian and Indian nationals in our ranks. What appeals to all of them is the freedom and creativity that our scientific institution offers and the relevance of our research. We are recognized in Europe as an institution that participates in numerous projects under the auspices of the Horizon programme. We have projects with NASA and many interesting projects implemented with the business sector, where we have proven to be a link that connects academia, industry, government institutions and civil society. Many projects we implement with various institutions and organizations from Europe and America facilitate close cooperation, exchange of knowledge and experiences, visits to those institutions, participation in conferences and publication of papers. All this makes BioSens a desirable place for young professionals who want to develop their careers in a stimulating environment.

**Q: The BIO4 campus is the state's most significant project and the largest investment in science and research. In which capacity will the BioSens Institute be involved in this project?**

A: BioSens was created with the idea of serving as a link between agriculture, biology, ecology, medicine and other biosciences and information technologies, so we are a multidisciplinary institution that uses IT to solve specific problems in the biosystem. That's why we see ourselves as an essential part of the BIO4 project that will provide significant support, primarily in data processing and sensor development. All biosystems generate a large amount of data, and companies collect a huge quantity of data that needs to be systematized. Based on our artificial intelligence and machine learning algorithms, we can systematize them, find mutual dependencies, and answer various questions. To get to that data, we need to have sensors, and this is where I see our Center for Sensor Technologies playing a significant role.

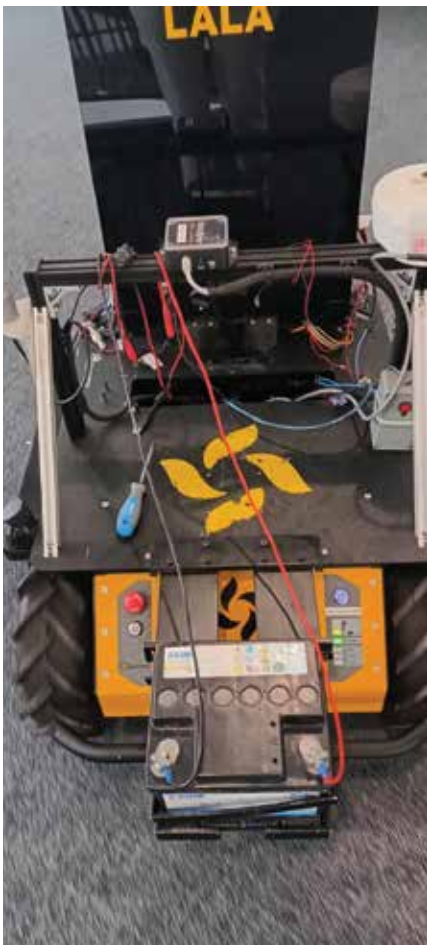
**Q: BioSens participates in a large number of EU-funded projects via the Horizon programme. What are the Institute's further plans and development direction? How will you improve the research infrastructure and capacities?**

A: With over 40 million euros that we withdrew from European funds, primarily through the Horizon programme, we occupy first place among scientific institutions in Serbia and are among the top 10 in Eastern Europe. Antares is the most significant project, funded with 14 million euros by the EU, while the Serbian government provided almost 20 million euros. Under the auspices of this project, BioSens became the European center of excellence in applying IT



Photographs: (middle left and bottom) BioSense Institute

We have projects with NASA and many interesting projects implemented with the business sector, where we have proven to be a link that connects academia, industry, government institutions and civil society




## DETECTION OF BURNING OF CROP RESIDUES

One of the projects implemented by BioSens researchers is the dim. rs web portal, which detects the burning of crop residues, which poses a big problem. The portal was created to detect burning activities on land plots and sanction that behaviour. "We use satellite technologies and time series analysis of multispectral images to detect an ongoing fire or a burned land plot. This is the first step in solving these problems: to see how many land plots are being burned and the consequences. The data will be used as a starting point for imposing penalties. Such activities harm the environment and negatively affect the health and safety of people, with even traffic accidents being caused by smoke from the fields", says Marko Oskar.

in sustainable agriculture. Further plans are to continue participating in EU programmes and boost cooperation with the business sector with which we already collaborate, i.e. with the two largest insurance companies in agriculture, as well as with the World Bank on a large-scale project related to digital banking and automatic assessment of clients. We also cooperate with sensor manufacturers and big agricultural companies. We strive to maintain a balance between European project funding and funding from the Serbian Ministry of Science, Technological Development and Innovation, as well as the income we generate from collaborating with companies. Since we have the latest scientific and research infrastructure in various scientific disciplines, the idea is to provide services to the research and business community and to ensure sustainability and constant modernization from the income obtained so that our researchers can maintain the competitiveness of this institution through continuous innovation.

Interview by Mirjana Vujadinović Tomevski

Photograph: (middle left) Pixabay/Kurt Bouda; (top right and middle right) BioSense Institute

# MANASIJA GETS A SOLAR POWER PLANT

The energy transition leaves no one behind – everyone is encouraged to turn to clean energy sources and reduce their carbon footprint to achieve a greener future as quickly as possible. Religious institutions have recently recognized the importance of renewable energy and energy independence, and many monasteries in our country already have solar panels on their premises.

MT-KOMEX is always ready to take on new challenges when it comes to building solar power plants. After constructing a 50-kW plant at the Žiča Monastery, they recently

After constructing a 50-kW plant at the Žiča Monastery, they recently completed another solar project at one of Serbia's most significant monasteries – Manasija



Photograph: (top) Wikipedia/Đorđe Marković; (bottom) MT-KOMEX

completed another solar project at one of Serbia's most significant monasteries – Manasija.

"This will mean a lot to the Manasija Monastery, especially in terms of material operations because we were paying huge electricity bills, and this power plant will significantly reduce those costs. It is also very important to take care of the environment for us as a nation to have a responsible attitude towards what God has created. I would advise everyone, anyone who has the means, to install solar panels, whether it is a monastery, a company, or a private home, especially in these times when we need more electricity," said Father Pavle, the abbot of Manasija Monastery.

The solar power plant in question has a capacity of 12 kW and consists of 30 panels with an individual capacity of 410 Wp. These are monofacial panels from the renowned manufacturer Luxor Solar. MT-KOMEX always chooses the most efficient and modern types of panels on the market, and collaboration with Luxor Solar is always a sure choice.

Filip Stojović, an engineer at MT-KOMEX, explains that the solar power plant at Manasija was built on the roof of a building next to the monastery to preserve the aesthetics of this Serbian shrine.

He adds that the solar power plant is connected to a single metering group. However, this was not an easy task, as the monastery had several metering groups that had to be unified into one. As always, the MT-KOMEX team successfully overcame this obstacle, so the monastery now has a single measurement, and all the electricity produced by the solar power plant can be delivered according to the consumption needs of the monastery's buildings.

The power plant is oriented southward, and the engineers designed it to maximize the use of solar energy

Stojović proudly notes that the installers built the power plant in three days, which is remarkably fast. According to him, the plan is for the solar power plant at Manasija Monastery to gain prosumer status, as this procedure today is quite simplified and takes three to four steps to complete.

The power plant is oriented southward, and the engineers designed it to maximize the use of solar energy. The estimated annual production of the solar power plant at Manasija is around 10,000 kWh per installed kWp, or 12,000 kWh annually. Thanks to this solar power plant, Manasija Monastery will contribute to an annual reduction of carbon dioxide emissions by 8,000 kg.

Regarding additional equipment, this power plant used a 10-kW inverter, which will enable obtaining prosumer status through a simplified procedure for power plants up to 10.8 kW. These inverters are from the Austrian manufacturer Fronius, with which MT-KOMEX has successfully realized 100 MW of power plants.

MT-KOMEX decided to donate the solar power plant to this great Serbian shrine. The plant represents much more than a one-time donation because users will be able to produce green energy and reduce their costs over the next 30 years.

With this, the company has completed its portfolio of over 200 built solar power plants with a total installed capacity exceeding 120 MW.

Alongside technical expertise, flexibility and adaptability ensure that the company's team can meet various client demands and always deliver the most efficient power plant.

Prepared by Milena Maglovski

Photographs: (middle) Wikipedia/Pavle Marjanović; (middle bellow) MT-KOMEX


# THE RENEWABLE ENERGY DAYS CONFERENCE IN PULA

From June 12th to 14th, the Renewable Energy Days, one of the most significant conferences on renewable energy in the region, was held in Pula, organized by the Renewable Energy Association of Croatia. Representatives from relevant institutions, businesses, and numerous associations gathered at this important event to find key solutions for the continued development of the renewable energy sector.

Public policies in the renewable energy sector were the theme of the first day of the Renewable Energy Days. Maja Pokrovac, Director of the Renewable Energy Association of Croatia, emphasized that each meeting of the energy sector was an opportunity for learning and growth.

"It is essential for the industry to take on a new form because the green transition not only enables progress in terms of clean energy but also creates jobs for highly educated young people and fosters regional development," said Maja Pokrovac.

Walburga Hemetsberger, Director of SolarPower Europe, congratulated Croatia on the "year of solar energy", noting that last year saw a 250 per cent increase in installations compared to the previous year. She also expressed concern that only two to three per cent of panels are currently manufactured in Europe. Giles Dickson, Director of WindEurope, expressed dissatisfaction that the development of renewable energy



Photographs: *DOKU FILMS*

sources in Croatia was still hindered by bureaucracy.

## Is Croatia on the sunny side of Europe?

The second day of the conference brought together numerous experts from the solar sector, all seeking to answer one question: Is Croatia on the sunny side of Europe?

Although the panel participants' answer to the question "Are we on the sunny side of Europe?" was affirmative, the conference allowed them to highlight numerous obstacles hindering the development of solar projects in neighboring countries.


The second day of the conference brought together numerous experts from the solar sector, all seeking to answer one question: Is Croatia on the sunny side of Europe?

Sanja Ivelj, Head of the Department for Energy Markets and Infrastructure, Energy Efficiency, and Renewable Energy Sources at the Ministry of Economy of the Republic of Croatia, noted that around 5,000 megawatts of energy permits have been issued for solar power plants since 2021. This is a satisfactory result, considering that the legislative framework underwent numerous reforms in 2021.

The leader of the TEC OI project, Goran Fržop, underlined that energy projects were of strategic importance and that strategy results from high-level thinking that must be backed by the state.

"When we say that 'the state will solve it', that must be the case. We, the users of the energy infrastructure, will pay for its use through various fees. Still, the burden of building key infrastructure cannot fall on the renewable energy projects", noted Mr Fržop.

Panel participants touched on the topic of non-traditional solar power plants, with a recent focus on agrisolar projects, which are based on the dual use of land—for electricity and food production.

The director of the EnergoVizija Company, Mario Turković, pointed out that agrisolar projects face additional specific issues in addition to all the problems encountered by traditional projects. He hopes the state will soon resolve these issues.

"There is some misunderstanding of the term 'agrisolar' and some ambiguities in the legal framework that we must resolve. It is necessary to legally define agrisolar projects to allow their implementation on agricultural land and prevent potential misuse of such projects where agriculture is

forgotten once the power plant is built and operational. The essence and purpose of agrisolar projects is the dual use of land", concluded Mr Turković.

Goran Slipac, PhD, assistant director at HEP ODS, also spoke on the panel and agreed that Croatia will undoubtedly remain on the sunny side of Europe.

"Since the beginning of the year, we have connected 165 MW of solar power plants to the power grid. We achieved an excellent result in the first five months, and in May alone, we added 53 MW, unprecedented in our recent history. We will break last year's record when we connected 8,700 units. I think we will reach around 10,000 units by the year-end", said Dr Slipac.

## How to Secure Funding for Renewable Energy Projects?

The final day of the conference had the issue of financing the renewable energy sector as one of its central themes.

During the Financing Renewable Energy Projects panel, it was noted that finding a secure source of funds is perhaps the biggest obstacle hindering the broader implementation of renewable energy sources and, thus, the energy transition we strive for.

Miloš Kostić, director of the MT-KOMEX Company, shared his experience with project financing, having been in this sector for over 10 years.

"We started investing in and building our first solar power plant in 2013, and it was very difficult then to explain what we wanted and obtain project financing. Nevertheless, we managed to secure a feed-in tariff in 2013, the most secure mechanism for financing and producing electricity. However, to this day, we have not had proper project financing," said Mr Kostić.

Jovanka Atanacković, Manager for Serbia at CWP Global, underlined that the renewable energy sector faces so many problems that it is fair to ask, "Why are we doing all this?" However, since there is no other solution for the energy transition, all key stakeholders must contribute to making renewable energy projects easier to implement.

> Panel participants touched on the topic of non-traditional solar power plants, with a recent focus on agrisolar projects, which are based on the dual use of land—for electricity and food production


When asked if state subsidies are necessary for financing renewable energy projects, Ms Atanacković expressed the view that the sector can do without them.

"Why are we seeking state subsidies? No matter how much they want to buy green energy and complete their green portfolio, customers sign two-year contracts with the Electric Power Industry of Serbia (EPS). After that period expires, we are again looking for some kind of state aid. We need to establish some standards. The state could set these standards, which I think is not ideal; rather, I believe this should be left to the market, where, in addition to producers and consumers, development banks and institutions must also be involved", explained Ms Atanacković.

Miloš Kostić, director of the MT-KOMEX Company, shared his experience with project financing, having been in this sector for over 10 years


She added that banks require price security to offer financing, and the problem is that the renewable energy sector is variable, making it less attractive in the market. Therefore, balancing services is crucial since green power plants cannot always produce energy when the market needs it.

On the other hand, the director of MT-KOMEX believes that the renewable energy sector's ability to function without state subsidies depends on many factors.

"If you are at the beginning of market development, as in 2009, no renewable energy projects could be implemented without subsidies. There's also the question of technology, i.e., whether it is sufficiently developed or is new. Technological development and increased production on a global level have contributed to the cost per kWp (kilowatt-peak) being much lower, which facilitates market competition without any subsidies", said Mr Kostić.

He also mentioned that his company participated in auctions last year and won the largest package in the solar domain.

The Renewable Energy Days conference created an opportunity for key stakeholders in this sector to exchange valuable experiences and gain important insights necessary for the further development of green energy. Furthermore, the conference offered participants a special mobile app to set up B2B meetings.

Prepared by Milena Maglovski

# INNOVATIVE SERIES OF ABB FREQUENCY CONVERTERS FOR ENVIRONMENTALLY SUSTAINABLE SOLAR WATER PUMPING SYSTEMS

ABB's Frequency Converters for Solar Pumps are addressing the challenges of providing water even in remote locations without access to the power grid. The drive uses photovoltaic panels as the energy source to operate water pumps. From dawn to dusk, the drive operates without energy costs easily and safely, with minimal $CO_2$ emissions.

Solar photovoltaic systems for water pumping are becoming increasingly significant worldwide. They play a crucial role in reducing $CO_2$ emissions. They can operate in areas poorly covered by the power grid, where a reliable water supply is essential to irrigate agricultural land, provide drinking water for livestock, and ensure potable water. ABB's new generation of ACQ80 frequency converters for solar pumps is designed to meet this need by enabling efficient operation of solar water pumping systems with a low carbon footprint, using clean solar energy. Compared to diesel-powered pump systems, the ACQ80 solar pump frequency converter is an environmentally friendly product with a long lifespan and low maintenance costs, given that it runs on solar energy.

## Key Features of the ACQ80 Frequency Converter

The ACQ80 frequency converter includes built-in Maximum Power Point Tracking (MPPT) technology, combined with a wide input voltage range of 225 to 800 VDC and PID control to achieve the desired water pressure in the pumping system during irri-

gation. This enables the converter to drive the pump motor even if the output power of the solar panels drops during periods of low sunlight. This broad range of operating conditions is a significant improvement over conventional frequency converters, allowing the maximum amount of water to be pumped at all times.

While the ACQ80 will mainly be used in off-grid installations that convert DC power from solar panels into AC power needed to operate the pump, this frequency converter can also be powered by AC voltage. This allows it to be connected to the local power grid or a generator, ensuring the continuity of the pump system operation during the night or periods of low sunlight by combining power from both DC and AC sources.

The ACQ80 also offers additional integrated functionalities required in pumping systems, such as flow calculation, dry-run protection, pump cleaning, and optimization of the water pumping process, minimizing human intervention. Additionally, it provides connectivity through Fieldbus communication protocols, allowing the frequency converter to be integrated into control systems. The ACQ80 is compatible with both asynchronous motors and highly efficient synchronous reluctance motors with permanent magnets (SynRM), suitable for both submersible and surface pump types.

The ACQ80 has been recognized by the Solar Impulse Foundation as an efficient solution, confirming the product's profitability and use of clean energy. This designation is awarded to products, services, and/or processes that combine credible environmental and economic performance while outperforming traditional options in their market.

## Example of Application: ABB's ACQ80 Solar Frequency Converters for Pumps

Esteban Carrero, an agricultural company specializing in pistachio farming, achieved 100 per cent system availability and reduced incidents by 90 per cent by installing ACQ80 frequency converters for solar pump operations, utilizing remote monitoring capabilities. The pistachio tree is an important crop in Castilla la Mancha, Spain. The cultivation area has significantly increased in recent years, covering around 12,000 hectares, accounting for 80 per cent of the national area. The pistachio production sector annually produces 1,000 tons, primarily in Ciudad Real, Toledo, and Albacete provinces.

Although the irrigation needs of this crop are not significant, they typically involve pumping water directly from the underground layer using submersible pumps. This agricultural company already used solar pump installations, including photovoltaic panels, a solar pump drive, and a submersible pump with a nominal power of 7.5 kW. The system was upgraded with new ACQ80 solar pump frequency converters from ABB. The upgrade resulted in clear performance improvements, with a 100 per cent increase in system availability, doubling the total usage time of solar radiation compared to the previous year, thanks to the wide operating range of the ACQ80. Additionally, the pistachio grower reduced site visits for incidents by 90 per cent due to the remote monitoring solution for crucial operating parameters via a wireless internet connection, resulting in fuel cost savings and reduced $CO_2$ emissions. ABB's solar pump frequency converter technology addresses the challenges of providing water whenever and wherever needed.

ABB

**Za više informacija kontaktirajte ABB u Srbiji:**
stefan.pavlovic@rs.abb.com
www.abb.rs

Photographs: ABB

# AVALA TOWER – A MORE ENERGY-EFFICIENT CITY SYMBOL

Avala Tower is undoubtedly one of the most recognizable Belgrade landmarks. Its observation deck provides a spectacular view stretching from Šumadija to the Vršac Tower, and thanks to its telecommunications equipment, it broadcasts television and radio signals. The Avala Tower is our most important telecommunications facility, with the highest allowed transmitter power, broadcasting three digital television channels or TV program packages, five analog radio programs using FM technology, and one digital radio program package using DAB+ technology. Very few people know that the transmitters consume about 130 kWh continuously, while the entire tower complex consumes about 200 kWh, amounting to approximately 150,000 kWh per month. Through rational use and procurement of the latest equipment, efforts are made to achieve maximum electricity savings.

Procuring newer generation transmitters, which are significantly more efficient, is the first step in energy savings. For example, Avala Tower previously used older-generation TV transmitters with a 20-per cent efficiency. A few years ago, technologically advanced transmitters with a significantly higher efficiency of 42 per cent were acquired. Sava Savić, director of the Emisiona Tehnika i Veze public enterprise, explains that this has saved about 30,000 kWh monthly and reduced $CO_2$ emissions by 12,000 kg. The same principle is applied to radio transmitters, and the replacement of older transmitters at Avala is planned soon.

"We save electricity by using air conditioning rationally and ordinary fans where possible. We have installed automation at nine transmission stations, which autonomously decides whether to turn on the air conditioning or the fan depending on the external and internal temperature. Analyzing the automation's operation, we found that the air



Photographs: JP Emisiona tehnika i veze

> The Avala Tower is our most important telecommunications facility, with the highest allowed transmitter power

conditioning was on only 15 per cent of the time, while the fan operated 85 per cent of the time. We estimate that we have saved about 9,000 kWh per transmission station with the advanced automated ventilation and air conditioning system," Savić explains.

He emphasizes that reducing transmitter power during nighttime hours when viewership and listenership are very low can save much energy with minimal reduction in the service area.

## Generators and Uninterrupted Power Supply

There is a system to ensure uninterrupted power supply at every important transmission facility, including Avala Tower. The system consists of uninterruptible power supply (UPS) devices and diesel generators of appropriate power. In the event of a power outage from the electrical grid, the UPS takes over broadcasting without interruption. The generator's automation detects the power outage and starts the generator. After about 15 seconds, the generator achieves stable voltage and frequency parameters, and the power supply is switched to the generator.

UPS capacities are designed to handle the full load and power the equipment for about 10 minutes, which is more than enough since the generator takes over in less than a minute. The generator capacities are designed to be loaded within 40-70 per cent of their maximum power.

"At Avala, we have the latest generation Schneider Electric UPS, with appropriate power and capacity, and three generators, each with a 400 kVA power. All UPS devices and diesel generators are modernized and connected to the monitoring system," adds Savić.

Digital broadcasting of TV and radio programs has undoubtedly brought enormous savings in electricity consumption and frequency usage as a limited resource. Digitalization has enabled one digital TV or radio transmitter to broadcast 16 programs on one frequency, whereas in the analog era, broadcasting 16 programs required 16 transmitters and 16 frequencies, making the conclusion obvious.

"Our company successfully transitioned to digital TV broadcasting on June 7, 2015, and began digital radio broadcasting on October 26, 2018, precisely from Avala Tower," our interlocutor adds.

## A Popular Tourist Spot

According to official ticket sales statistics for the observation deck, Avala Tower attracts 200,000 visitors annually. By the end of May this year, 82,000 people had already visited the observation deck. The tourist site is always bustling, with visitors enjoying the complimentary amenities. The youngest visitors can enjoy the children's playground and the Elf Village, while older visitors can use the outdoor gym, artificial rock climbing wall, and sports courts. For a short break, there are three catering facilities and a souvenir shop run by the Serbian Tourist Board.

From April to October, the plateau below the Serbian tripod hosts social weekend events for the whole family and music, theater, and gastronomy enthusiasts. The event calendar is available on the website www.avalskitoranj.rs.

Prepared by Milica Radičević

The research will establish two key production steps: the mechanical repair of titanium and the formulation of activation for efficient water oxidation

# OXYREPAIR – A STEP TOWARDS MORE EFFICIENT HYDROMETALLURGY AND GREEN ENERGY STORAGE

An innovative technological procedure for the complete processing and repair of waste titanium electrodes from hydrometallurgy is the subject of research in the OxyRePair project, which, in the period from 2023 to 2025, is financed by the Science Fund of the Republic of Serbia. The project was financed as part of the Green Program of Cooperation between Science and Industry, and the project holder is the National Institute of Chemistry, Technology, and Metallurgy of the University of Belgrade, which carries out research in cooperation with four other scientific and higher education institutions from Serbia.

The research results will offer domestic and regional industrial environment technology for restoring waste electrode resources, with a secondary reaction of water oxidation and electricity consumption. At this moment, the processing and restoration of the electrodes require considerable costs. The electrode manufacturing process will be operationally optimized for the first time to predict the manufacturing parameters of any electrode shape required by specific processes.

The research will establish two key production steps: the mechanical repair of titanium and the formulation of activation for efficient water oxidation.

The setup will be closely related to the main goal of operational research: predicting the conditions of each step to reach an acceptable lifespan of the recovered electrode resource for an economically acceptable production process.

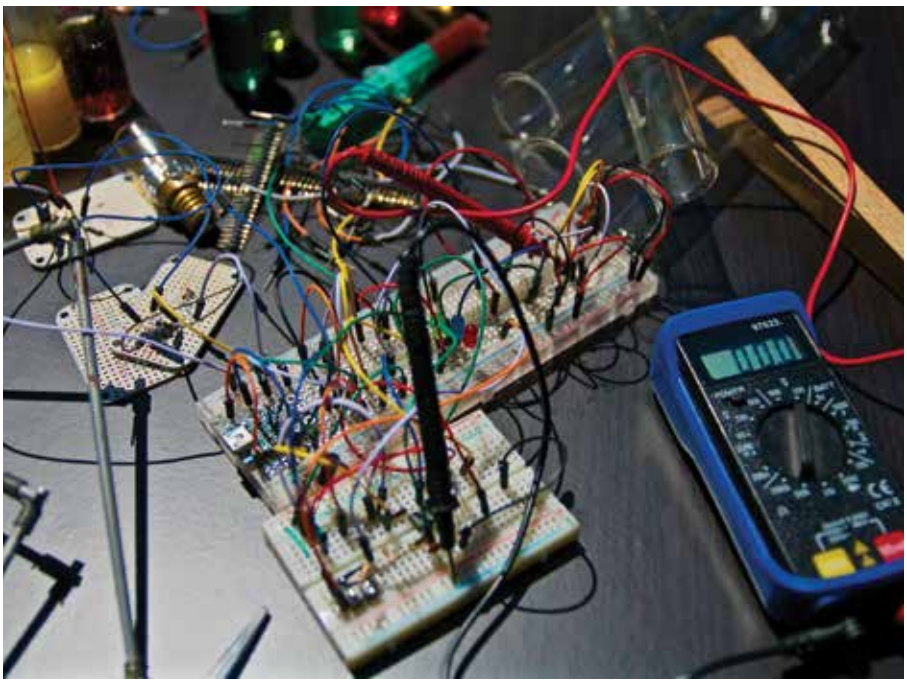
Project results refer mostly to specific industrial entities that deal with the electrochemical production of metals. Companies that produce precious metal powders and metal food packaging do not practice remanufacturing process electrodes as a step for a sustainable closed economic circle but choose between buying new and repairing deactivated anodes, depending on cost-effectiveness. Deactivated electrodes



Photographs: (top) Unsplash/M; (middle) Unsplash/Thisisengineering


accumulate as process waste and take up production space. The project results will enable companies to close the loop on the use of electrodes with optimized on-site technology. In addition, the project activities will propose specific procedures for a given production environment to extend the lifespan of the electrode and thus reduce the frequency of intermittent interruptions of the production process.

Specific on-site technology will thus significantly reduce production costs and improve industrial waste management. According to the proposed technology, the deactivated electrode resource, which is disposed of as process waste, will be recovered by the users themselves, which is currently not possible and constitutes a significant environmental aspect of the project. This will significantly reduce companies' costs related to the disposal and care of waste resources and the acquisition of new electrode equipment.



At the domestic and regional economic levels, the project will offer a significant technological procedure for many important and modern industrial branches but does not exist as a technological solution. The procedural solution also contains an aspect of innovation concerning equivalent traditional offers in countries such as Italy, Germany, China, and India. At the global level, the contribution of the project results in improving energy efficiency within the concept of engaging renewable energy sources is also expected.

The main value of the project's innovative technology is its wide application: it can be used for the processes of cathodic protection of steel structures against corrosion, treatment of industrial wastewater, and water electrolysis for the storage of green hydrogen fuel from renewable energy sources.

Project Team OxyRePair

Photographs: (top) OxyRePair; (bottom) Unsplash/Nicolas Thomas

# MOL GROUP IS A LEADING PLAYER IN CREATING A GREEN AND SELF-SUSTAINING REGION

In mid-March of this year, MOL Group updated its long-term strategy SHAPE TOMORROW, according to which the company aims to make the region greener, more self-sustainable and more competitive. MOL Group ensures a smart transition with defined solutions by further strengthening the security of supply in the region, creating value from waste and shaping the future of mobility with innovative technologies. The updated strategy emphasizes renewable fuels, green hydrogen, biomethane and geothermal energy. In the coming years, the company will invest more than $4 billion in green investments and aims to achieve carbon neutrality by 2050.




Photographs: MOL Group

We believe that MOL Group will meet its goals because, in the past month, the company has opened two factories that meet the strategy's goals.

In mid-April, a green hydrogen plant was opened in Százhalombatta, which will produce as many as 1,600 tons of green hydrogen per year using electricity from renewable sources. It is the largest green hydrogen plant in Central and Eastern Europe, with a capacity of 10 Megawatts. The investment of 22 million euros will make fuel production more sustainable, and the factory will reduce carbon dioxide emissions from the Danube refinery by 25,000 tons per year. The new technology will gradually replace the production process based on natural gas, which currently accounts for one-sixth of MOL Group's total carbon dioxide emissions. It will primarily use green hydrogen in its own network during fuel production. We asked MOL Group representatives to explain how they will make green hydrogen, and here is their answer:

"MOL Group has reached another milestone: from now on, we can produce green hydrogen without emitting greenhouse gases.

With this technology, we achieve a reduction in emissions that is equivalent to removing around 5,500 vehicles from the road at once. Today, our new green hydrogen plant makes MOL's industrial operations greener, but tomorrow, it will offer solutions for the entire industry and hydrogen mobility. After Sasalombata, we will transfer the technology to the other two production units in Rijeka and Bratislava to make the fuel production process more sustainable in all MOL Group refineries," said József Molnár, CEO of MOL Group, at the opening ceremony of the new green hydrogen plant.

The second factory, more precisely, the polyol complex, was opened in mid-May in Tiszaújváros. The value of this investment is as much as 1.3 billion euros, and the complex has a capacity of about 200,000 tons of polyol per year

The second factory, more precisely, the polyol complex, was opened in mid-May in Tiszaújváros. The value of this investment is as much as 1.3 billion euros, and the complex has a capacity of about 200,000 tons of polyol per year. With the opening of the polyol factory, MOL Group became the only entity in Hungary and Central and Eastern Europe that covers the entire value chain, from oil refining to the production of polyol (a plastic raw material with an extensive application). Polyol is one of the most sought-after plastic raw materials, used in a wide range of industries from automotive manufacturing to clothing and insulation. Polyurethane is made from polyols and is the base material for many consumer durables that everyone encounters daily. The plant in Tiszaújváros will produce polyol using one of the most efficient and environmentally friendly methods available today. According to MOL's calculations, the factory will annually contribute nearly 150 million euros to the financial results of the MOL Group and will provide long-term employment for almost 300 people.

MOL Group creates value from waste, starts a circular economy and additionally strengthens the security of supply.

There is no doubt that the energy transition must be implemented, and the very ambitious goals set by the European Union must be achieved. This is in the interest of all actors on the market. MOL Group, as a leading company in the Central European industry, is doing everything it can to fulfil these goals and transform the company.

Mol Group

# ZAGREB ON THE PATH TO CLIMATE NEUTRALITY

Careful planning of the preservation of existing green areas and planting greenery in new areas is very important, especially for the urban environment. Greenery reduces air pollution, mitigates the effects of tropical heat, and increases resistance to floods and extreme weather events. Zagreb was one of the cities that demonstrated a strong commitment to such during the previous planting season when the city got 8,000 new trees.

Following the adoption of the Green Urban Renewal Strategy for the City of Zagreb, plans are in place for developing green infrastructure, achieving energy efficiency goals, adapting to climate change, and boosting resistance to risks.

> In terms of waste management, the construction of the new facility in Resnik will ensure the processing of mixed municipal waste, bio-waste, paper, plastic and metal in line with the latest standards

Zagreb's commitment is also reflected in the city's entry into the European Union's Mission of 100 climate-neutral and smart cities, whereby the city government committed to drafting and implementing the Climate City Contract.

This document reflects the political determination and vision of decarbonization in the city's key sectors. It primarily refers to decarbonizing the built environment (buildings), traffic, (centralized) heating and cooling systems and related activities.

"The complete transformation of the planning and implementation process of decarbonization measures and adaptation to climate change is underway. Our goal is to include elements of decarbonization and adaptation in all city processes and key documents. We started the



Photograph: Pixabay/Strgars

process by implementing higher energy efficiency standards, using renewable energy sources and incorporating adaptation elements into spatial plans", explains Ana Pavičić Kaselj from the city's office department for economic affairs, environmental sustainability and strategic planning.

### HEALTHY FOOD FOR SCHOOLCHILDREN

The pilot project of green public food procurement for elementary schools in Zagreb will feed schoolchildren with organic produce. The main goals are to provide students with healthy, good quality, ecologically and locally produced food and, at the same time, create a market for farmers and their ecologically grown produce, which, in turn, will contribute to mitigating climate change. The project will last from 2023 to 2026 and currently includes 31 elementary schools in Zagreb. If the plan is feasible, the goal is that all schools and city institutions serving meals will be included in green public food procurement.

Regarding waste management, the construction of the new facility in Resnik will ensure the processing of mixed municipal waste, bio-waste, paper, plastic, and metal is in line with the latest standards. Ms Pavičić Kaselj points out that the facility is a unique plant for mechanical-biological waste treatment (MBT) of the latest generation, completely closed, without releasing unpleasant odors and harmful emissions into the environment, which uses the best currently available technologies in the EU and includes a mixed waste processing plant and a sorting and composting plant.

## Energy efficiency and decarbonization of traffic

The energy rehabilitation of public buildings in Zagreb is carried out in line with a clearly established plan, all to save energy and reduce CO2 emissions by more than 50 per cent in each building. During the building renovation, economically viable and energy-efficient technologies, renewable energy sources, and environmentally friendly fuels are applied.

"The plan related to energy efficiency and renewable energy sources projects for public use, covering the period from 2024 to 2026, which the City Assembly adopted in December 2023, identifies the facilities that will be renovated to boost their energy efficiency as well as construction and extension of public purpose buildings. A budget of around 133,000,000 euros is planned for these projects this and the next two years", adds Ms Pavičić Kaselj.

### SOLAR POWER PLANTS ON PUBLIC BUILDINGS

Eight solar power plants were installed on public buildings in Zagreb under the auspices of the SOLIZAG project. The project was designed to increase the use of renewable energy sources and show how public institutions can save energy and reduce $CO_2$ emissions.

Regarding traffic decarbonization, the city's priority is to make public city transport faster, more reliable, and more efficient, which will contribute to an increasing number of citizens using this type of transport over their vehicles. Although encouraging public urban transport alone will not completely and immediately solve the problem of motor vehicle exhaust gases, improving the quality and speed of urban public passenger transport is a sure and proven way to reduce air pollution and the number of vehicles on city roads.

Prepared by Milica Radičević

Photographs: (bottom) Pixabay/Goran Horvat; (middle) Unsplash/Kristina Kutlesa

# OLD PRESS IN A NEW GUISE

The production of paper requires a lot of electricity, water, and cellulose, and as we all know, it is "easily and quickly" used up; that is why rational consumption, recycling, or reuse is important in many ways. Nada Ubiparip from Mrkonjić Grad reveals to us how old paper can be breathed new life and given a new use value. In addition to taking care of her family as the mother of three children, she manages to find time to devote herself to her hobby. She is a technician-clothing designer by profession, but unfortunately, she did not have the opportunity and possibility to tailor and sew. Instead, she found a way to express her creativity by making baskets from old newspapers.

I have never worked in the profession, and the main reason is that this job requires an adequate workspace, which I do not have. Although I also know how to tailor and sew something, I decided to put that aside and choose something that I can do anywhere in the house. When I was little, my mother taught me how to knit, and that's how I came up with the idea of using that knowledge to create something new and beautiful – Nada explains.

At first, she used to knit hats, scarves, and sweaters for her children. Then, quite by chance, while watching various clips, she came across one in which a woman makes paper baskets. She recalls that it delighted her, so she spent hours and days learning and perfecting paper knitting.

Today, Nada's creative hands produce baskets of various motifs, sizes, and shapes. On her Instagram



Photographs: courtesy of Nada Ubiparip

page, Nadinokorparstvo, you can see baskets made for Easter, New Year, and Christmas, baskets in the shape of bees, carts, huge toy baskets, and even fashion bags.

She reveals that her favorite work is the basket – a cart that actually serves as a holder for pencils and school supplies.

For making baskets, I get old press from a country in the region because the paper is much better than what can be found here. First, I design what the basket will look like, and then the production follows. The crafting process itself begins by first preparing the paper, then I make the sticks, paint them, and then weave them. I usually have some model, molds of all kinds of shapes for different baskets. I always knit the bottom first, then when I finish it, I raise the sticks and knit as high as I need – our interlocutor explains.

She points out that the colors she uses are ecological and that they are safe even if they come into contact with food. So, the baskets can be used for various services at home.

She adds that, depending on storage, baskets can last for several years, and she has been using one that she hasn't even painted for six years. Regarding the time it takes her to make these handicrafts, a small basket can be made in about an hour, while for larger ones, like baskets for toys, which are huge, she has to spend four to six hours to make them.

The quality of her products is evidenced by orders from almost all countries of the region, as well as Austria and Germany. In addition to baskets, she also crochets toys, and as she says, many babies enjoy her work, which makes her especially happy. That is why she tries to make high-quality products, always tries to improve her skills, and advises others to do the same.

Remember that it is always better to have a quality product than to have hundreds of them sold but of questionable quality. Try to learn, improve yourself, and progress so that you can see the huge difference between the first and last work. Currently, the Internet plays a big role in our lives, and we should make the most of it for learning and acquiring new knowledge, Nada says.

She is especially proud of the fact that she creates her products from waste. She tries extremely hard to use every piece of paper and hopes that her example will be an inspiration to others to make the planet a healthier place to live with their seemingly small endeavors.

Prepared by Jasna Dragojević

She is especially proud of the fact that she creates her products from waste


# WE ARE ACTIVELY REDUCING $CO_2$ EMISSIONS IN OUR OPERATIONS

This year marks the 20th anniversary of Generali Group's first corporate social responsibility department. Two decades later, Generali demonstrates its social responsibility through four distinct roles:

- responsible employer,
- responsible corporate citizen,
- responsible insurer, and
- responsible investor.

– As a responsible investor, we invest in the economic sectors that positively impact the environment and society. As a responsible insurer, we offer products with ESG components. As a responsible corporate citizen, we contribute to our community via Generali Group's global initiative The Human Safety Net. As a responsible employer, we promote workplace diversity, equity, and inclusion and support our employees' professional and personal growth. All this makes us a sought-after employer – says Vesna Brkić Bošković, Head of the Logistics and Procurement Department at Generali Osiguranje Srbija.

We discussed the company's plans in terms of $CO_2$ emissions reduction targets, how the employees engage in this process, and what they consider to be an important message when it comes to their views on sustainability.

**Q: One of the Generali's goals is $CO_2$ emission reduction. What are the company's specific targets?**

A: Generali Group aims to cut $CO_2$ emissions in its operations by 35 per cent by 2025 and by 40 per cent by 2026 from the 2019 baseline. The 2023 results indicate that we are on the right track with a 33.4 per cent reduction compared to 2019. This achievement required management and employee support and a dedicated energy and environment management team. Our company has long held ISO 14001 and ISO 50001 certifications for environmental and energy management systems, respectively.

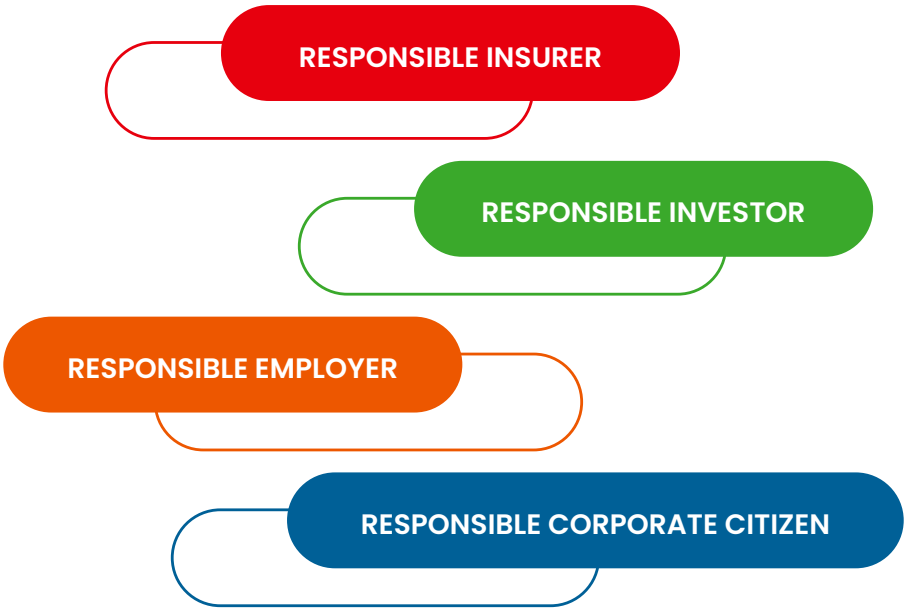
## VEHICLE FLEET REPLACEMENT

Throughout 2024–2026, we plan to invest significantly in vehicle fleet replacement. Currently using mild hybrids, Generali plans substantial changes to its fleet, with new models meeting specific $CO_2$ emission and fuel consumption requirements. Hybrid and electric vehicles available locally will be prioritized.



Photographs: (top) Pixabay/Aernout Bouwman; (middle right) *Generali*

Generali Group aims to cut $CO^2$ emissions in its operations by 35 per cent by 2025 and by 40 per cent by 2026 from the 2019 baseline




Generali Group's goal is to cut $CO_2$ emissions in its operations by 35 per cent by 2025 and 40 per cent by 2026, compared to the 2019 baseline.

Generali Group's sustainability activities include purchasing renewable electricity, enhancing office energy efficiency, and optimizing the use of business premises. We are also committed to reducing business travel, transitioning to electric company cars, and minimizing paper use through digitizing and optimizing our processes.

**Q: The employees themselves play an important role in reaching these targets. How are they involved in this process?**

A: Our employees are integral to reaching sustainability targets. They will soon relocate to our new headquarters, which will also hold energy efficiency certification and have the option to use renewable electricity. Last year, our local ESG team developed an action plan focusing on environmental and energy efficiency initiatives. Our employees – our sustainability ambassadors – collaborated with managers on this plan. Their suggestions have sparked initiatives to reduce paper usage by further digitizing processes, minimizing physical mail, reducing the quantity of printed documents, and keeping track of the quantity of printed material.

Vesna Brkić Bošković,
**Head of the Logistics and Procurement Department Generali Osiguranje Srbija**

Training employees and raising awareness about the importance of reducing carbon footprint is vital. In addition to Group-level training, we have initiated local workshops and numerous activities to educate our colleagues on how they can contribute to environmental protection. We have participated in tree planting in Novi Sad and Niš and various clean-up campaigns. Goals can only be achieved if the employees are motivated, engaged, and willing to extend our activities into their communities.

**Q: What do you consider to be an important message when it comes to the environment?**

A: Once all activities are completed, it is time to evaluate their impact and draw comparisons. Companies must have a system and clear methodology in place. Since 2019, we have recorded data on fuel, electricity, and paper consumption, waste recycling rates, and business travel mileage in the Sphera app. All this data is documented for external audit and verification. It not only serves as a reliable indicator of our correct decisions but also demonstrates their tangible and significant impact on environmental preservation.

Generali Osiguranje Srbija

Photograph: courtesy of Vesna Brkić Bošković

# ENERGY SECURITY THROUGH THE DEVELOPMENT OF THE PROSUMER MARKET

Much has been said recently about prosumers (consumer-producers) of electricity from renewable sources in Serbia, but little is still known. Promoting energy security and independence involves empowering citizens and businesses to produce energy for their needs, primarily through solar power, which helps reduce pollution and greenhouse gas emissions.

Lazar Ivanović, the chief economist at CEVES, an independent research and development organization, co-authors a study titled "Promoting Energy Security Through the Development of the Prosumer Market". The study was conducted to provide a comprehensive overview of the prosumer market in Serbia. Alongside a detailed overview of the situation in the Western Balkans (Bosnia and Herzegovina, Montenegro, North Macedonia, Albania), Serbia was used as a case study focusing on the household sector, which is of greatest interest to most citizens.

Ivanović states that the development of the prosumer market in Serbia is very slow compared to wealthier and technologically advanced EU countries and neighboring countries with a similar level of development. Since 2021, when the new Law on Renewable Energy Sources came into force, until the end of May this year, according to Elektrodistribucija Srbije, the number of registered prosumers was 2,300 households and only three residential communities, with a total installed capacity of less than



Photograph: Unsplash/Dina Lydia

Lazar Ivanović
**the chief economist at CEVES**

> Regarding energy efficiency or intensity, the economies of the Western Balkans need about 56 per cent more energy on average to produce the same amount of GDP as the EU

19 MW, which is about 0.5 per cent of the planned capacities for 2023.

"When adding the economy to this, we get about 3,000 prosumers with less than 52 MW of electricity production capacity. On the other hand, significantly smaller economies like Albania and North Macedonia already had total prosumer capacities exceeding 119 MW and 129 MW, respectively, in the first half of 2023. Even Montenegro, with ten times fewer inhabitants than Serbia, managed to reach 4,000 prosumers with a total installed capacity of 43.5 MW by mid-May 2024," says Ivanović.

Energy Consumption Per Capita

According to Eurostat data for 2022, households in Serbia consume 165 kWh of electricity per capita per month, about 15 per cent more than the Western Balkans average and 24 per cent more than the EU average. Households in Montenegro consume the most—185 KWh, while those in Albania consume the least—100 KWh.

> What is far more problematic for the countries in the region is the rest of the energy mix, which is predominantly (about 65 per cent) composed of fossil fuels, while their share in the EU is about 20 per cent lower

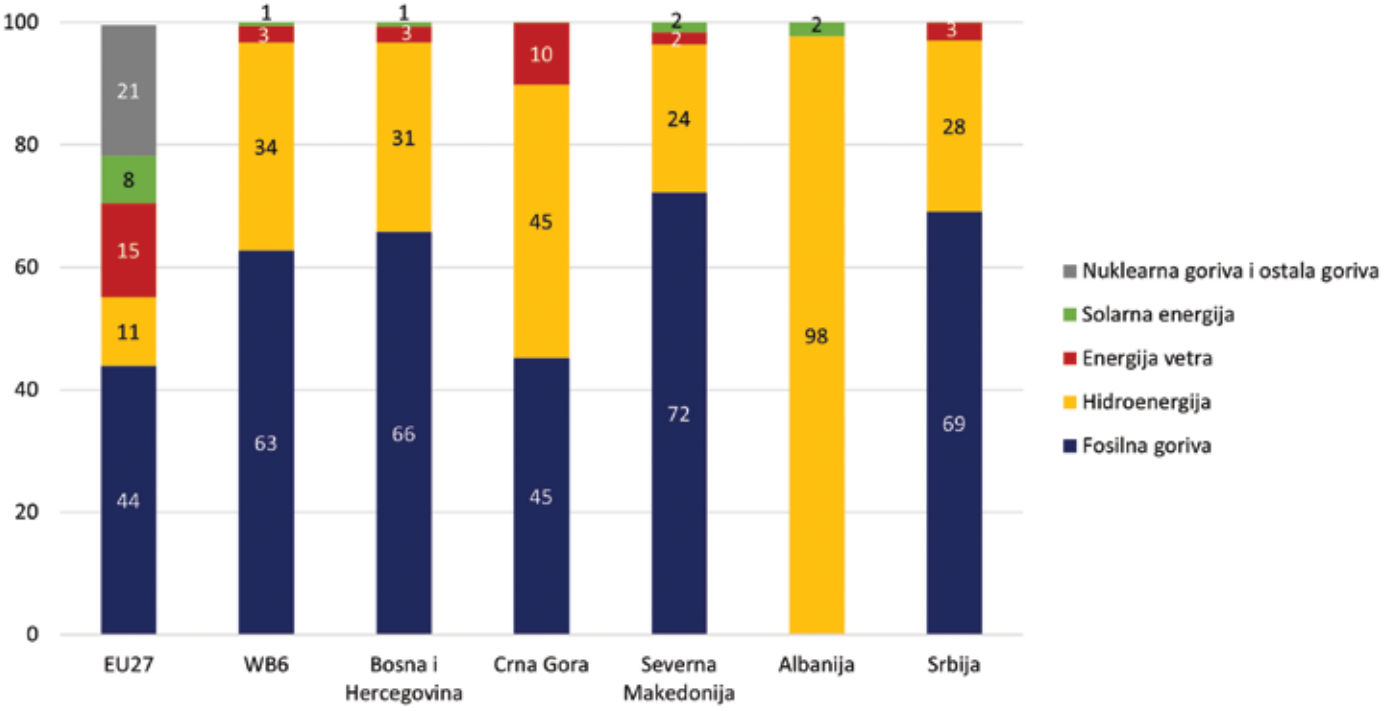
Regarding energy efficiency or intensity, the economies of the Western Balkans need about 56 per cent more energy on average to produce the same amount of GDP as the EU. Ivanović states that although the energy intensity of these economies, measured as total available energy divided by GDP, has fallen by 20 per cent since 2017, the EU managed to reduce it even more (by 25 per cent), worsening the region's energy efficiency relative to EU member states. The main reason for higher energy intensity in the Western Balkans is a combination of low electricity prices and decades of

Photographs: (bottom) Pixabay/Alexander Droeger; (Ivanović) courtesy of Lazar Ivanović

insufficient investment in energy efficiency.

According to the study, the Western Balkans had a slightly higher share of RES in electricity production in 2022 (37.3 per cent net) than the EU (34.5 per cent). However, while the EU increased its RES share by eight per cent from 2016 to 2022, it decreased by about 1.5 per cent in the Western Balkans over the same period.

According to the study, the Western Balkans had a slightly higher share of RES in electricity production in 2022 (37.3 per cent net) compared to the EU (34.5 per cent)




## A FAVOURABLE SOLUTION FOR RESIDENTIAL COMMUNITIES

Lazar Ivanović conducted the study with co-author Pavle Medić, deputy chief economist at CEVES. According to the study's recommendations, one potentially good solution is using the ESCO model, where residential communities could pay ESCO companies for services based on energy sales or savings generated by the solar power plant. This is especially favorable considering the low purchasing power and creditworthiness of many households in Serbia. It is also necessary to introduce tax incentives for prosumers, such as abolishing VAT on the delivery and installation of solar panels.

"When it comes to solar energy, it accounted for only about 0.6 per cent of total net electricity production in the Western Balkans in 2022 (about 7.7 per cent in the EU), but its share increased sixfold compared to 2016 (twice in the EU). The situation varies from country to country and is unfavorable for Serbia," explains Ivanović.

The study's results show that not only do all Western Balkan countries have a higher share of solar energy in total electricity production compared to Serbia, but North Macedonia, Bosnia and Herzegovina, and Albania also produce more solar energy in absolute terms (92, 114, 161 GWh net annually) compared to significantly larger Serbia (16 GWh).

## Solar Potential

What is far more problematic for the countries in the region is the rest of the energy mix, which is predominantly (about 65 per cent) composed of fossil fuels, while their share in the EU is about 20 per cent lower. Nuclear energy, which is not present in our region, covers the difference. Natural gas is also underrepresented in the Western Balkans energy mix, accounting for just nine per cent compared to 21 per cent in the EU.

According to our interlocutor, Serbia has enormous potential for solar energy production thanks to its favorable geographical location and climatic conditions. According to a 2022 study, the estimated potential electricity production from solar energy in Serbia is about 30.5 TWh annually, nearly 80 per cent of our current gross electricity production.



Illustration: courtesy of Lazar Ivanović

"Additionally, according to the Ministry of Mining and Energy, if solar panels were installed on just 10 per cent of the total roof area in Serbia, it would create installed capacities of six GW, which is 1.8 times more than our current renewable energy capacities," Ivanović said.

## Recommendations for Improvement

The study also included recommendations for improving the situation in Serbia's renewable energy and prosumer markets. The general impression after the research is that the management of the power system in Serbia is highly inefficient not only due to the small number of prosumers, high levels of electricity production from fossil fuels, and low energy efficiency but also because Serbia found itself needing to import electricity and gas in the middle of an energy crisis. This was at a time when their prices were at historical highs, costing up to three per cent of GDP.

"It should be noted that despite all the advantages, prosumers are not, nor should they be viewed as the solution to all problems, but merely as part of the formula for achieving energy security and decarbonization. There are objective limitations, such as grid balancing, which requires significant investment in energy storage through the construction of reversible hydroelectric plants, and the fact that investments in the distribution network are not cheap," says Ivanović.

Regarding specific recommendations from the study, Serbia should start with the most essential things. The country needs to conduct an official analysis to determine the ultimate capacities of the distribution network and determine how many prosumers can be connected to the grid at a given time and location. It is necessary to introduce certification of solar equipment installers and create a list of certified companies to establish appropriate standards, digitize procedures for obtaining prosumer status, adequately inform citizens, and equalize the level of expertise of Elektrodistribucija across the country.

Ivanović emphasizes the need to legally regulate renewable energy communities (energy cooperatives) and provide them with benefits such as cheaper state land leases, lower taxes and fees, cheaper loans, etc. Third parties should also be able to be prosumers on someone else's roof and sell solar electricity, which is already a common practice in the European Union.

Prepared by Mirjana Vujadinović Tomevski

Photographs: (bottom) Unsplash/American Public Power Association; (midle) MT-KOMEX


# ECO FORUM – SUSTAINABLE FUTURE

This year's Eco Forum Zlatibor, organized by the Vozim Na Struju Company, was dedicated to implementing ESG strategies, sustainability, renewable energy sources, reducing carbon footprints, waste management, etc.

At the opening of the Eco Forum, Edin Đerlek, Deputy Speaker of the Serbian Parliament, underlined the need to raise environmental awareness and pay special attention to recycling, waste management, circular economy, e-mobility, and renewable energy sources.

"The forum's lectures also covered the automotive industry, where innovations that indirectly impact environmental protection were presented. We had the opportunity not only to listen to lectures on PM particles but


Photographs: Eco Forum

also to measure them in front of the Eco Forum participants," said Zorana Đorić, representative of Vozim Na Struju.

Over 40 speakers discussed climate change, circular economy, and other topics. It was noted that Serbia has achievements to be proud of but also faces challenges

Over 40 speakers discussed climate change, circular economy, and other topics. It was noted that Serbia has achievements to be proud of but also faces challenges.

"I would especially highlight the presentations by students who had the opportunity to showcase their innovative solutions, which clearly indicates that young people are highly aware of sustainable development," added Đorić.

## Renewable Energy Transformation and E-Mobility

A panel dedicated to renewable energy sources was very popular.

Miloš Kostić, director of MT-KOMEX, which has been promoting renewable energy in Serbia for many years and has been building solar power plants across the country and region, stated that he recognized solar energy as the future back in 2011. At that time, he transformed the company towards renewable sources and embarked on a project development endeavor no one had undertaken. As he says, the company managed to build two solar power plants of 2 MW back then.

"Today, those plants still produce electricity according to planned capacities and are in good condition. By 2017, we began developing projects and building power plants for industrial enterprises.

Our company has built over 120 MW of solar power plants to date. Including all other market participants, Serbia has reached 200 MW of built solar power plants," Kostić said.

Iva Đinđić Ćosić spoke about the balancing responsibility of market participants and mentioned that many participants and interested parties are waiting and wanting to join the power system, making this issue significant. She talked about the new law, amendments, and supplements to the Renewable Energy Law, which opened a new chapter by introducing batteries or storage for the produced electricity that will not be immediately released but at a later period.

During this panel, there was also a discussion about the development of e-mobility in Serbia. Kostić added that he began developing that segment in 2016, and logically, the next step was founding the Charge&GO Company.

"We currently own 70 ultra-fast and fast chargers on Serbia's roads. Our partner is OMV, with 14 ultra-fast chargers installed at their stations. The largest charger we commission will be 240 kW, and all chargers on the highways are over 100 kW. There are locations where we have connection issues, mostly in urban areas. We are trying to develop the network as much as possible, and we will install 10 new chargers as our investment this year. We have expanded to the Macedonian market, delivering nine chargers there. We plan to expand to Bosnia and Herzegovina and Montenegro and install over 250 chargers within the next three years, which we will also manage," Kostić explained.

Đorić added that e-mobility is the present, not the future, and what's great about introducing electric vehicles is the quotas, making it easy to track how many electric vehicles each company has.

"In Serbia, we have a company with 300 electric vehicles in its fleet, so we are not lagging behind other countries," Đorić emphasized.

Vozim Na Struju organized Eco Forum Zlatibor with the support of GIZ and the Chamber of Commerce and Industry of Serbia.

Prepared by Milica Radičević

The extermination of birds of prey in certain locations has resulted in a dramatic disruption of the ecosystem because birds of prey hunt rodents, reptiles, and other birds and thus keep their population under control

# WHERE HAVE THE FALCONS GONE?

The sky above Serbia has always been adorned with a multitude of birds of prey, and one of them – the Eastern Imperial Eagle- has a special place on our country's official coat of arms. Throughout history, falcons have enjoyed the same respect because, as faithful companions of the nobility in hunting, they have become part of the national emblem. Emperor Dušan often hunted with peregrine falcons, and in the Middle Ages, Serbia was one of the most important countries in Europe as far as falconry was concerned.

Unfortunately, these birds of prey have lost their popularity today, and devastating news about poisoned birds destroyed nests and poaching is becoming more frequent.

The extermination of birds of prey in certain locations has resulted in a dramatic disruption of the ecosystem because birds of prey hunt rodents, reptiles, and other birds and thus keep their population under control. That is why numerous animal protection associations are using all available resources to ensure that birds of prey are not wiped out of Serbia's biodiversity.

Fortunately, there are also people who, because of their love for feathered raptors, have chosen an unusual profession and are ready to contribute to protecting these species.

Perica Miletić from Kraljevo is one of the few falconers in Serbia. His interest in falconry developed in high school.

Today, he says, only very few people are engaged in falconry and those



Photographs: (top) Pixabay/Alexa; (middle) courtesy of Perica Miletić

who keep birds of prey mostly take care of them for fun and as a hobby. Falcons are often bought on the black market, and smugglers usually catch them illegally in the wild, although many captured birds are endangered.

Raising falconry to a higher level and complying with all animal welfare criteria requires a lot of effort. Although every bird enjoys royal treatment in Mr Miletić's kennel, he does have a favorite bird.

"My favorite raptor is the Gyrfalcon. It is the largest and most beautiful falcon in the world. It lives in the polar regions of Russia, Alaska, northern parts of Scandinavia and Canada. It tolerates very low temperatures well and is the only predator in the north all year round. This falcon has four morphoses – black, grey, silver and white, of which the white one is the most beautiful. Also, white falcons are the most valued in the world", explains Mr Miletić.

He says that buyers from developed Arab countries are very interested in falcons bred in Serbia, where, unlike our country, numerous competitions in flight speed and appearance are held.

However, true falconers, in addition to raising birds, often contribute to the care and treatment of many endangered and injured animals.

Mr Miletić, as a great bird lover, builds houses for smaller birds every winter and feeds them, and several times, he had the opportunity to save some.

## Better protection for falcons in Serbia

In our country, many feathered raptors are considered endangered species and the saker falcon and peregrine falcons are at the very top.

The peregrine falcon lives in mountainous regions of our country, such as Tara, Kopaonik, Stara Planina, and Suva Planina. It nests on high cliffs in canyons and gorges and feeds exclusively on birds.

According to official data, the main threats to peregrine falcons are habitat destruction, poaching, pesticide poisoning, and a reduction in the number of prey species. However, Mr Miletić notes that pigeon fanciers often destroy falcon nests and use various poisons to suppress the falcon population.

"Even though such activities are prohibited and regulated by law, no pigeon fancier has ever been held accountable in court or penalized", says our interlocutor.

He adds that a great deal of education is needed to prevent the poisoning of predators that feed on rodents when it comes to the use of pesticides on agricultural land.

"The use of DDT pesticide became popular since the end of the Second World War, and since then, the number of falcons has decreased rapidly. The scientists concluded that this pesticide remained in the bodies of rodents and birds that the falcons hunted. This led to the peregrine falcon almost disappearing in North America. In addition to banning that pesticide, a program was launched that entailed cooperation between international scientists and falconers who already knew the secret of artificial insemination and thus restored the peregrine falcon population. Today, the peregrine falcon is no longer an endangered species in most countries in the world", says our interlocutor.

However, since the number of domestic falcon species has been declining in recent years, it is necessary to raise awareness of the importance of this species and, accordingly, in cooperation with the Ministry of Environmental Protection, take concrete steps, suggests Mr Miletić.

"Having special permits for taking some specimens from nature for artificial insemination and later returning new individuals to increase the population is just one example that could give good results, which has already proven successful in many countries. However, raising people's awareness of the significance of birds of prey in the ecosystem is the most important", says the falconer.

Mr Miletić concludes that various discussions, public hearings and many other educational workshops should be organized so that primarily the younger population corrects some of the mistakes we made in the past.

Prepared by Milena Maglovski

Photographs: courtesy of Perica Miletić

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