ENERGETSKI PORTAL SRBIJE

ECOMOBILITY

MAGAZINE NR 8 ■ JULY 2017

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NEW e-GOLF

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THE SWEDISH AMBASSADOR

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Dear readers,

A new bulletin is in front of you, but it is not just another in series of our online magazines. On the contrary, this edition represents our step forward in any sense. As you can notice, the new bulletin got a new look, but apart from modern visual design, for which our new editor of graphic design was in charge of, the content of this bulletin is quite different due to the efforts of newly formed team that consists of six journalists.

For this issue we have chosen a very current topic of eco-mobility and I hope that we have succeeded in presenting this topic with the fastest development rate in the world (which is also becoming increasingly important in the region and in the Republic of Serbia) in an interesting way.

For the first time we have public figures from our county and region as interlocutors who have tried to present the progress in eco-mobility as well as their contribution to this plan.

Apart from the interlocutors listed on the front page, in this number you can read the interviews with the General Managers of the leading car manufacturers: Milan Lazić, General Manager of VW and Aleksandra Đurđević, General Manager of Delta Motors. These companies were the first to start selling electric cars in Serbia and thus triggered revolution in the domestic market. In a conversation with Milan Belin, General Manager of Renault, we have tried to get the answer when we can expect to see ZOE on our market, which is the most popular model of this manufacturer. Taking into account the underdeveloped network of chargers in Serbia, we have prepared the story with the company MT-Komex that cooperates with ABB and Schneider on the installation of chargers.

Since the eco-mobility does not include only electric cars, but also other vehicles and innovative types of ecological transport, we are presenting to you E Prime, the Belgrade-based company that has launched two-wheel vehicles – modern, city, electric bikes.

In addition to innovations in the automotive world, in this bulletin we are presenting to you novelties in sustainable urban public transport. I believe that you will find very interesting the article on new busses of the company Volvo, that have recently started operating on the streets of Čačak, as well as the article on the ecological innovations that Volvo is introducing in their trucks.

There are also interviews with many professionals, students and young entrepreneurs, but everything that we have mentioned in this introduction is just a small part of everything that you are going to read in this issue.

Hope that you will enjoy as much as we did in preparing of this issue.

Nevena Đukić,
Editor in Chief

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Rambo revealed to us how far did he come with his project "Solar Retro Sailboat", why hybrid vehicles are the best choice for each driver at the moment, but also why it is important to preserve the cleanness of the sea, land and air for future generations.

IN THIS ISSUE

HISTORY OF HYBRID AND ELECTRIC VEHICLES

from the first cars until today

When it comes to cars today, it mainly refers to vehicles with an internal combustion engine (ICE) that draws its energy from a reservoir containing some kind of fossil fuel (gasoline, diesel or less natural gas). However, it is not known that the situation was quite different 100 years ago.

At the beginning of the 20th century, you could find steam cars, electric vehicles, as well as the vehicles with internal combustion engine. Of all these types of vehicles, the most common were electric ones. The reason for this was the fact that vehicles with ICE had to be physically started by turning the crank, which was a difficult task. With the invention of electromechanical ICE starter, this problem was solved.

The main advantage of the ICE was the amount of energy that could fit into one tank, which directly affected the distance that the vehicle could go without having to fill in the tank. In addition, fossil fuel sources (in the first place, oil) seemed almost inexhaustible. It was these reasons why vehicles with ICE quickly expelled electric vehicles from use and during most of the 20th century they represented the only option.

However, as the number of cars in use increased, the negative sides of the ICE were also displayed. Primarily, air quality and noise level in urban areas have deteriorated significantly with the increase in the number of motor vehicles. In addition, the social awareness of global warning, as a consequence of human action has been increasing year in year out.

Bearing in mind, besides all this, the inevitable limit of oil reserves, a motivation arose to find alternatives to ICE engines. Thus, electric vehicles came back to the center of attention.

The first attempts in the recent history to produce an electric vehicle were in the early 1990s. In 1996, General Motors introduced the electric vehicle model in serial production under the name "EV1". Over the next three years, this model was sold in more than 1,000 units. However, due to the limited battery technology at that moment, the manufacturer decided to stop the production of this model.

The main problems were a gradual decrease in battery capacity over time, and therefore a decrease in the autonomy of the vehicle. In addition, the initial range of vehicles was about 100 kilometers, which made the vehicle unsuitable for long journeys. For these reasons rises the idea of combining classical technology (ICE and reservoirs) with environmentally friendly technologies (electromotor and battery). The first hybrid electric vehicles originated from this idea.

The first mass-produced hybrid vehicle – Toyota Prius – appeared on the Japanese market in December 1997. Over the next three years, this vehicle was sold in more than 50,000 units. Until today this vehicle has achieved the greatest commercial success of all hybrid electric vehi-

Photo (from left to right): General Motors (1996) – Wikimedia/BrainPhotography (Rick Rowen), https://commons.wikimedia.org/w/index.php?curid=14727110 • Steamcar (1769) – Wikimedia/Roby©, https://commons.wikimedia.org/w/index.php?curid=41639 • Ford T Runabout (1910) - Wikimedia/LgJswe, https://commons.wikimedia.org/w/index.php?curid=2288103 • Chevrolet Volt (2011) – Wikimedia/NRMA New Cars, https://commons.wikimedia.org/w/index.php?curid=17782649

cles with a total of 6.1 million units sold worldwide. The main advantage of this vehicle is the ability to use exclusively battery power in the city environment and at the same time, at higher speeds and longer journeys, an ICE would automatically be switched on to charge the battery through the generator. Since the vehicle contains a reservoir, the problem with the range has been solved.

However, the next challenge was reflected in the impossibility of charging the battery without the participation of an ICE and the use of fossil fuels, which brought their negative sides with them. For this reason, there has been the development of the idea of hybrid electric vehicles that could be charged from the electricity grid.

Today "plug-in" hybrid electric vehicles (abbreviated "PHEV") or hybrid electric vehicles that can be charged directly from the electricity grid are increasingly represented on the market. The most famous representatives of this group of vehicles are Chevrolet Volt (sold in Europe under the name of "Opel Ampera") and "Mitsubishi Outlander PHEV", which together have over 260,000 units sold in the previous four years.

The main advantage of these vehicles is the fact that for most of the everyday needs of users, it is not necessary to use fuel at all. Most of these vehicles have a battery autonomy of about 50 kilometers, which meets the needs of an average consumer. This means that these vehicles could be used during the day for journeys shorter than 50 kilometers and when the day is over, they are left to be charged overnight when the price of KWh of electricity is lower and the power grid is unburdened.

However, the compromise is that it is still necessary to use fuel for longer journeys. In addition, for the use of this type of vehicle (as well as completely electric vehicles), it is necessary that there is a developed infrastructure of public stations for their charging.

Although "plug-in" hybrid electric vehicles are at the top of the technology of motor vehicles, they nevertheless represent only a transition stage. Their main advantage is that they have a much higher range (about 800 km) compared to conventional electric vehicles (typically about 200 km). The main reason for a short range of electric vehicles is low battery capacity in relation to their weight and dimensions. The ratio between the amount of energy contained in 1 liter of fuel and lithium-ion batteries (as used in electric vehicles) of the same dimension is as much as 100:1.

The advantage of electric over ICE (engines) is significantly higher utilization rate (60-80 percent for electric versus 15-20 percent for ICE engines). Yet, it is still not enough for an electric vehicle to have the same range as a vehicle with an ICE engine. In order to achieve this, it is necessary that the ratio is closer to 5:1, which requires a lot of investments in the development of new technologies for the production of batteries, so that they have as much energy density as possible and the best possible price.

The fact is that over time hybrid or fully electric vehicles will be increasingly represented on the streets and that the number of such models will only increase in the future. It is also clear that this will not happen overnight, but this is a process that can last for decades. What will speed up this process is the will of the society to accept and support these changes.

EU members have signed Europe 2020 strategy, a document in which one of the main objectives is to turn to renewable energy sources. At the end of 2016, the upper house of the German federal parliament (Bundesrat) announced that it intends to abolish the sale of diesel and gasoline vehicles from Germany in 2030. The Norwegian Government has expressed similar intentions.

These efforts will contribute to making electric vehicles available to everyone in the future and able to meet all the needs of people for economy and ecological transport. As far as our country is concerned, we are still lagging behind in comparison to developed countries. The will exists on all levels, but when it comes to realization, it is very bad..

Lazar Živković

For this reason Energy Portal decided to choose ECO-MOBILITY as the main topic for this edition of the bulletin, with the idea to set Serbia in motion with joint forces when it comes to green traffic, or to have a direct influence on official institutions to introduce incentives for importers and buyers of electrical, hybrid and low fuel consumption vehicles, to start the development of the infrastructure of electric chargers and the production of alternative fuels, but also to reinforce the awareness of a common man that energy efficient and environmentally friendly vehicles are the only correct way if we want to preserve the environment for future generations.

Photo (from left to right): 1602 • Tesla 3 (2016) – Wikimedia/Steve Jurvetson, https://commons.wikimedia.org/w/index.php?curid=48139054

Jan Lundin
the Swedish Ambassador

Substantial Level of Economic Development is the Key to Greater Ecomobility

The Kingdom of Sweden has built up a great reputation in the world as a country that pays considerable attention to the preservation of the environment. Innovative and quality solutions for environmental protection are constantly emerging throughout this Scandinavian country and the Swedish government is trying through a series of investments, shares of technology and examples of good practice, to support the developing countries in their endeavor to improve the quality of life. The Kingdom of Sweden donates to Serbia as much as 11 million euros annually, out of which 4 million are invested in the field of environmental protection.

Considering the fact that Sweden has made significant progress in the traffic electrification, we wanted to find out more about the results of the applied methods from Jan Lundin, the Ambassador of Sweden in Serbia.

EP In Serbia and around the world, Sweden serves as an example of the country with extremely developed ecological awareness. Is the knowledge about the importance of preserving and protecting the environment part of tradition and culture in your country? How is that consciousness being developed?

Jan Lundin I would not like to guess, but it is a fact that the Swedes got used to living in harmony with nature. We have a lot of forests, a large number of lakes and in general we are rich in water, and we do like to spend time in nature. When it comes to this, I think Sweden does not differ much from Serbia, because there are also many nature-lovers here. There is ongoing campaign "Do not litter, you have no excuse!" in Serbian media, and it reminds me of similar activities taking place in Sweden at the beginning 1970's that drew great attention to the problem of waste management. However, the media campaign is one thing. Although there is no doubt it contributes to raising awareness that people shouldn't leave trash around, but the level of infrastructure development is completely different thing. If the infrastructure hasn't been developed, then the campaign doesn't make any sense. The truth is there are no simple solutions, but the combination of raising awareness activities and good organization provides the proper result.

EP Among other things, Scandinavian countries are well-known for the everyday use of a bicycle as a means of transport. How come the bike is so popular across Sweden?

Jan Lundin The Swedes have always been riding bikes. For thirty years, my grandfather used to cover 20 km by bike every day, going to work, and as much on his way back, and he was not the only one. Perhaps one of the reasons for the popularity of bikes in cities and villages across Sweden is actually the fact that our settlements are rather far-flung.

Photo: Jan Lundin

DRIVE NOW

In conversation with Jan we learned about the DriveNow application, which allows commuters to rent a car in Stockholm, as well as in other major European cities. This application provides a filter that allows users to choose an electric car. Cars are rented per minute, and the price of a minute is 50 cents, which is very affordable compared to the price of taxi rentals.

The average drive around Stockholm takes between 10 and 15 minutes, and having reached your destination, you can leave the vehicle at any car park in the city that has a parking spot for the DriveNow application users. The reservation of the selected vehicle is made by mobile phone, and the car is generally available within a half an hour. The vehicle is automatically unlocked by approaching the car with the same mobile phone you used for making the reservation and the payment is done by a credit card. When staying in Stockholm, Ambassador Lundin often chooses to drive the BMW i3.

If you visit Serbian village, especially in Vojvodina, you will see that people mainly live in the center, while the farms are in the surrounding area. On the contrary, houses in Swedish villages are widely distributed with each household situated in the middle of individual property, so the bike was necessary and usual means of transportation until late winter. Back then it was believed that riding a bike is undoubtedly better and healthier habit. Thanks to this attitude, bicycles are still in mass use today throughout the country, even in Stockholm which has developed infrastructure. I am very glad about the progress in the development of bicycle infrastructure that Belgrade has been gradually making, although the local hilliness is surely an aggravating factor.

EP Do Swedish automobile manufacturers make electromobiles? How is the purchase of an electric vehicle encouraged?

Jan Lundin There have been attempts to produce electric cars in Sweden, as well as in Norway, but none of the factories prevailed on the market. I suppose it is hard to make money today on electromobiles and only big producers can accomplish that. Even Tesla couldn't make significant profit for more than ten years since it was founded. We are

Photo: www.drive-now.com/se/fi/how-it-works

JAN LUNDIN, THE SWEDISH AMBASSADOR IN SERBIA

Lundin got a master degree in law from the University of Stockholm in 1996. Previously he graduated from the University of Uppsala, in the Department of Slavic Languages, Eastern European Studies and Economics. Alongside with his native Swedish, he speaks ten languages fluently, including Serbian, English, German, Russian, French and Italian.

Jan Lundin is the Ambassador of Sweden in Serbia since 28 July 2016 which is his third diplomatic mission in our country. Before coming to this position, he was Director General of Permanent International Secretariat of the Council of the Baltic Sea States (CBSS).

still waiting for the real breakthrough of electric vehicles, although sales of these cars are growing, primarily in Norway, and to some extent in Sweden. Of the total number of cars in Sweden, currently 3.4 percent are electric-driven and this percentage is constantly increasing. For purchase of an electric vehicle, the states gives a subsidy of about 40,000 Swedish crowns, which is just over 4,000 euros. Although there are incentives for the purchase of electric vehicles, people are reluctant to buy them because they are still very expensive and have no sufficient range to match up to cars on petrol or diesel. In addition, another factor that can affect the efficiency of batteries is Swedish low temperature.

EP Norway is also a very cold country, and despite of that, it is still an absolute leader in Europe when it comes to the share of electric cars in relation to the total number of vehicles. How do you explain the success of Norwegians in setting up the necessary infrastructure for electric vehicles in such a short time?

Jan Lundin Norway is somewhat warmer than Sweden, however it is also extremely cold in the north of this country. There are also subsidies in Norway for buying electric vehicles, but I don't know if they are bigger than those we grant. One should not ignore the fact that in Norway gross national income is about 75,000 euros a year, and in Sweden about 50,000. None of these two countries is poor, but Norway is still considerably richer. A good economic situation is an indispensable condition for the purchase of Tesla, whose models cost about 100 thousand euros.

EP During 2014 several Swedish companies successfully performed the tests for electric ferries. Are they nowadays in use in public transport along the Channel and Lake Stockholm?

Jan Lundin It was a pilot project, started partly because of the undeniable advantages of electric maritime transport such are: silence, zero emissions of greenhouse gases, clean air and a quiet ride. Eco-friendly ferries can help us have cleaner cities and water, healthier marine ecosystems, satisfied travelers and lower prices. Several manufacturers were selected, whose ships had a capacity of 70 to 100 passengers and the ability to reduce emissions. This contributed to the reduction of operating costs by 30%. The project was supported by the Swedish Energy Agency and it has been successfully implemented, and now there are plans to gradually increase the number of ferry lines for the transportation of passengers.

EP Last year Sweden announced the construction of an electric highway – are you familiar with the progress of this project?

Jan Lundin It is in an experimental phase, which means that only one section which is 2 km long was built in northern Sweden, between Gävle and Sandviken. It is planned that the pilot project lasts for two years, with subsequent aftermath based on the obtained results. The project derived from long-standing cooperation between the Swedish government and the domestic manufacturer of the Scania truck and the German company Siemens. Trucks with batteries that are in use today can't cover great distances,

Photo: Jan Lundin

so on Scania trucks, which are however hybrid vehicles on biodiesel, trolleys are built in and they serve as direct connection to the grid. In Sweden, however, buses and trucks are massively using biodiesel. This is merely one of a great number of pioneering enterprises in our country that gives an opportunity to test different technological solutions. There is an idea to built the distribution network, like rails, into asphalt.

EP Swedish public companies have recently started the projects of replacing conventional vehicles with electric models, and now this type of vehicle is used by the police. What is the situation with other public services and urban transport?

Jan Lundin Electric vehicles are in use in a large number of municipalities in Sweden. Our goal is to completely stop using fossil fuels by 2030, and up to this moment we are on the right track. The Swedish police is currently testing electric cars for city driving. A significant share in the total number of electric cars (3.4 percent of the total number of vehicles) are precisely these vehicles used by public services, probably because they have more resources than individuals for their purchase. It's a shame that we don't have trolleys - it's simple technology, old, but functional. It would be good for trolleys and trams to stay on the rails in your country, but the power they use should not come from fossil fuels. In the long run, coal-related plans have to be changed. Hydroelectric plants like Djerdap don't pose a problem, nor does solar technology. It has always made me wonder why these sources are not used to a greater extent. Nevertheless, the good news is that Serbia has several solar power plants and furthermore, there are plans to build more plants on solar energy.

Interview by: Nevena Đukić

Photos: imagebank.sweden.se

Sweden plans to completely stop using fossil fuels by 2030

SOLAR IMPULSE A Plane That Went around the World Only by Using Solar Power

Tour the planet by plane without consuming a liter of fuel? Everyone would say it was impossible. But not two enthusiasts, fans of flying and renewable energy sources – Bertrand Piccard and André Borschberg

Photo: Solar-powered aircraft Solar Impulse 2 / Photo: Solar Impulse (CC BY-NC-SA 2.0)

On March 9, 2015, ABB, a leader in the power and automation market, proudly saw off the aircraft Solar Impulse II and two brave pilots –to a flight around the globe.

Crossing their route in carefully planned stages, Piccard and Borschberg were changing as pilots while the aircraft, powered solely by solar power, flew over five continents. A year later, in July 2016, Solar Impulse returned to Abu Dhabi by crossing an impressive 40,000 kilometers.

This revolutionary flight will enter into history with three broken world records, of which the biggest feat is that they were in the air for 117 hours and 52 minutes, from Nagoya in Japan to Hawaii, and on this occasion, they passed 8,924 kilometers without using any fuel whatsoever.

All this would not be possible if this aircraft did not have 17,248 solar cells on its wings, whose range is 72 meters, which allows the aircraft to fully charge its batteries and thus stay in the air and during the night. In order to be filled to capacity and withstand the night flight, the aircraft had to fly at a height that topped Mount Everest.

– If you want to be an innovator, you have to be a pioneer! The desire to fly the Solar Impulse will never abandon me or just to look at it while it is in the air. When you see these four electric motors that lift it up, without noise, without pollution, you have the feeling that you have just jumped into the future. Thanks to new technologies, the future is here today! – said then, Bertrand Piccard.

And how did it all begin?

Bertrand Piccard, a pioneer of Swiss aviation and a psychiatrist, who was a part of the first team to fly around the globe in a balloon in 1999, and his colleague Andre Borschberg, an entrepreneur, and engineer, decided in 2003 to launch the Solar Impulse project.

From 2010 to the present, in the prototype solar powered aircraft Solar Impulse I, and later aircraft Solar Impulse II, they have jointly set up a multitude of international aviation records on flights over Europe, North Africa and the United States, including a record for duration, height and flight distance.

When you see these four electric motors that lift it up, without noise, without pollution, **you have the feeling that you have just jumped into the future**

All photos: Solar Impulse

Two ABB engineers from Serbia joined the Solar Impulse team – Tamara Turšijan and Stevan Marinković

Company ABB became a permanent associate to this flying tandem in 2014, as they shared interest in aeronautics, clean technology, and renewable energy sources. In Switzerland, they established an Innovation and Technology Alliance to achieve a mutual vision of reducing resource consumption and increasing the use of renewable energy sources.

Several ABB engineers joined the Solar Impulse team and, with their expertise and dedication, contributed to the mission. Their work included improving the control system for ground operations, improving battery charging electronics on the aircraft and solving obstacles that would appear along the route.

Two ABB engineers from Serbia joined the Solar Impulse team – Tamara Turšijan and Stevan Marinković.

– Solar Impulse was created with the idea to inspire new generations to embrace innovations and technologies for solving the biggest challenges on the planet. ABB followed the Solar Impulse team on every mile of the way – said Ulrich Spiesshofer, the chief executive officer of ABB.

ABB's enthusiasm for the Solar Impulse Project arose not only from the mutual faith in innovation and technology but also from the slogan of the company "Power and Productivity for a better world". The spirit of the Solar Impulse project reflects the aspirations of ABB to foster operational efficiency, reduce resource consumption, enable sustainable transport and increase the penetration of clean, renewable energy.

– This aircraft is basically a flying smart network that collects energy from renewable sources and then returns

it to consumers in an efficient way – notes Andre Borschberg.

As the world's second largest supplier of solar inverters and one of the largest suppliers of generators for wind farms, ABB is the leader in the efficient and reliable integration of renewable energy sources into power grids. ABB helps in building a comprehensive network for fast charging of electric vehicles in Europe and delivers key equipment for the world's largest network of fast chargers for electric carsin China.

The director of this project, Bertrand Piccard, said that ABB, with its leading technologies that enable the production of energy from renewable sources and encourage the energy efficiency of the Solar Impulse team, has contributed that the team persists in its intention and demonstrates the power of innovation and clean technology.

– That's what the world needs. Otherwise, we will lose all our natural resources – said Piccard, and added:

– I want to tell all the doubting Thomases to be careful because innovations never come from the system. The candle-sellers did not invent the bulb. Everything you use today, tomorrow will be outdated, so if you want to be advanced, you need to change the way you think. Only those who are flexible will succeed in adapting to changes. Just think of the dinosaurs. They were huge and powerful and they were notable to adapt. If an airplane can fly for days and nights without fuel, solely on solar power, do not let anyone convince you that the same is impossible for cars, heating and cooling systems and computers one day.

For more information about ABB's collaboration on the Solar Impulse project, visit http://new.abb.com/betterworld.

For more information on the Solar Impulse project visit www.solarimpulse.com or connect with this joyful team through Facebook or Twitter.

Prepared by: Vera Rakić

ABB is the world's leading energy and industrial automation company, which helps its users to more efficiently use electricity, increase industrial productivity and reduce harmful effects on the environment. ABB Group operates in around 100 countries and employs around 145,000 people.

Milan Lazić

Environmentally Responsible Companies and Citizens Are Becoming Increasingly Interested in Our Electric Cars

In this region, the first thing that comes to your mind when you mention Volkswagen is golf, since this car has been a favourite vehicle for decades. Times are changing, new technologies are being introduced, but Volkswagen is still in the top of automotive industry. It comes as no surprise, when this company has launched completely new version of it. It is of course new e-Golf – at the same time comfortable and sporty, reliable and smart car which meets the latest ecological standards.

To make things even better, this car as well as other Volkswagen's hybrid and electric cars can also be purchased in our country. Our interlocutor Milan Lazić, General Manager of Volkswagen in Serbia, will reveal to us the innovations that e-Golf and e-Up! and other eco cars from their fleet bring to us. He will also tell us something about the obstacles that do not allow us to see more electric cars on the streets and parking lots.

EP Last spring, at the Car Show in Belgrade, the company Volkswagen unveiled two electric cars to the visitors. Does this mean that you believe Serbia has matured enough to accept the concept of ecology vehicles not only at the level of idea, but also in practice?

Milan Lazić At this year's Car Show Volkswagen has presented two electric cars – e-Golf and e-Up! As the part of European car market, Serbia is definitely involved in changes and new trends that are taking place in car industry. Of course, digitalization and electric mobility will not be implemented on our market at the same time and with the same intensity as it is already happening in highly developed European countries, but we will certainly catch up.

Competition will have to make efforts in order to respond adequately to Volkswagen's challenge in the domain of electric vehicle production

EP Definitely it is not easy to be an importer of such vehicles in the countries of Western Balkans, especially in the countries that still haven't joined the European Union and have not harmonized regulations on traffic. What would be the main problems you face in Serbia?

Milan Lazić The first obstacle is certainly the origin of certain components of electric vehicles, such as batteries, heat pumps, etc. that are often manufactured outside the EU so when importing we pay extremely high customs costs. The incentives of any kind are lacking, and charging infrastructure is definitely a problem. However, it is interesting that the process of registration and insurance is quite simple and it is done on the basis of declared power of aggregate, and it is the same with the obligatory insurance.

All photos: Volkswagen

EP How interested are customers in buying your hybrid and electric cars in our country? Are there any serious buyers?

Milan Lazić The sale of Volkswagen's electric cars has already begun on out market. In 2016 the first cars were delivered. In particular, one international bank has purchased a fleet of 7 e-Up! cars. After almost a year of driving these cars on our roads, the client has only words of praise and they are satisfied with the purchase of their electric fleet. They have participated with us several times in the presentations of electric cars to the media, as well as to our dealers and clients, emphasizing the benefits of driving these cars in comparison to the traditional aggregate.

Ecologically responsible companies as well as individuals are showing greater interest in our new product. Of course, at this moment, everything is still at the level of inquiries about technical characteristics of electric cars, experience from other markets, our forecasts on the development of charging infrastructure and about price policy.

EP How many of them give up from buying electric cars due to aforementioned obstacles and decide to buy a car on petrol of diesel?

Milan Lazić The fact is that almost 100 per cent of our clients still decide to buy a car with petrol or diesel aggregates. However, the times are slowly changing.

EP What are your predictions for launching of the market in Serbia?

Milan Lazić Whether the sales of e-cars will develop at a faster or slower rate depends on a variety factors: state's subsidies for the purchase of electric cars, development of charging infrastructure, benefits for drivers (such as reserved parking lots with chargers in public garages, the possibility of driving on bus lanes...) and other advantages that exist in other countries.

EP Can you give us some positive examples that are proved to be successful in developed countries – what are the incentives that importers have, and what incentives do the buyers of "green" Volkswagen's cars have?

Milan Lazić Developed e-markets do not have any fees for the import of electric cars. On the contrary, the incentives are mostly financial and they range, depending on the model, from 5,000 to 10,000 euros. In addition, charging (recharging) at public stations is free and the cost of annual registration is less than one euro. Electric vehicles are allowed to enter the immediate city zones, the parking is free and a special benefit is allowed driving on bus lanes.

EP As the search for public chargers here is still like looking for a needle in a haystack, can you tell us how you meet

the needs of potential clients and also tourists or business people who want charge their for example e-Up! on their way through our country? Where can they do that? What are your plans for the development of charging infrastructure?

Milan Lazić Construction of infrastructure that is setting up the network of chargers is the project which we are intensively working on. The first AC charger was installed a few months ago in front of Porsche Belgrade North's sales and service centre on Zrenjaninski road. Currently, the strongest available charger of 50 kW will be placed at the same location in the following few weeks. Also, we have a plan for installing a charger in front of sales and service centre of Porsche Novi Sad. Also, there are chargers in IKEA department store, Obilićev venac garage and in a few hotels and shopping malls. There are applications that provide precise information on charger location and charger type as well as other useful notes. These apps definitely make it easier for users to plan charging of their electric vehicles.

Developed e-markets do not have any fees for the import of electric cars. The incentives are from 5,000 to 10,000 euros, charging is free and the cost of annual registration is almost free of charge. **Electric vehicles are allowed to enter the immediate city zones, the parking is free**, and a special benefit is **allowed driving on bus lanes**

EP Why would one opt for e-Golf? Tell us how many kilometres can you travel with a single charge, that is, what is the battery's capacity?

Milan Lazić The new e-Golf has several different available driving profiles so that you can choose a comfortable or sporty type. The maximum range is 300km with a single battery charge in ECO mode.

EP What are the advantages of e-Up!?

Milan Lazić The range that e-Up! can reach with a single charge is up to 160 km and that is what makes this car ideal for every day usage. In addition to efficiency, e-Up! is characterized by the latest technological innovations that represent standard in far higher segments. Also, its agility and dimensions make it a perfect city car.

EP Of course e-Up! and e-golf are not the only electric cars that Volkswagen offers. Tell us something about them and also about the concepts that are still under development.

Milan Lazić Currently, Volkswagen's feet has two models of electric cars in its offer, e-Up! and e-Golf. An abundance of electric cars are expected from 2020, and we would single out I.D. concept – SUV model I.D. Cross.

EP What does Volkswagen offer from freight and passenger programs? Do you work on the introduction of eco-mobility on this plan?

Milan Lazić All brands within Volkswagen Group, including MAN and Scania, are intensively working on the production of models with the electric drive.

EP Many manufacturers of electric cars have a problem with the battery production technology, can you tell us something about capacities of your batteries? What innovations does Volkswagen plan to introduce in this area?

Milan Lazić Volkswagen plans to start the production of batteries in two factories that are located in European Union in the next five years.

EP Given the fact that Tesla car is still beyond reach in many countries, simply because it is too expensive, the experts in electromobility believe that Volkswagen Group is the only one that can draw parallel to Elon Musk with its energy efficient and affordable cars. Can you tell us something about your strategy for the future?

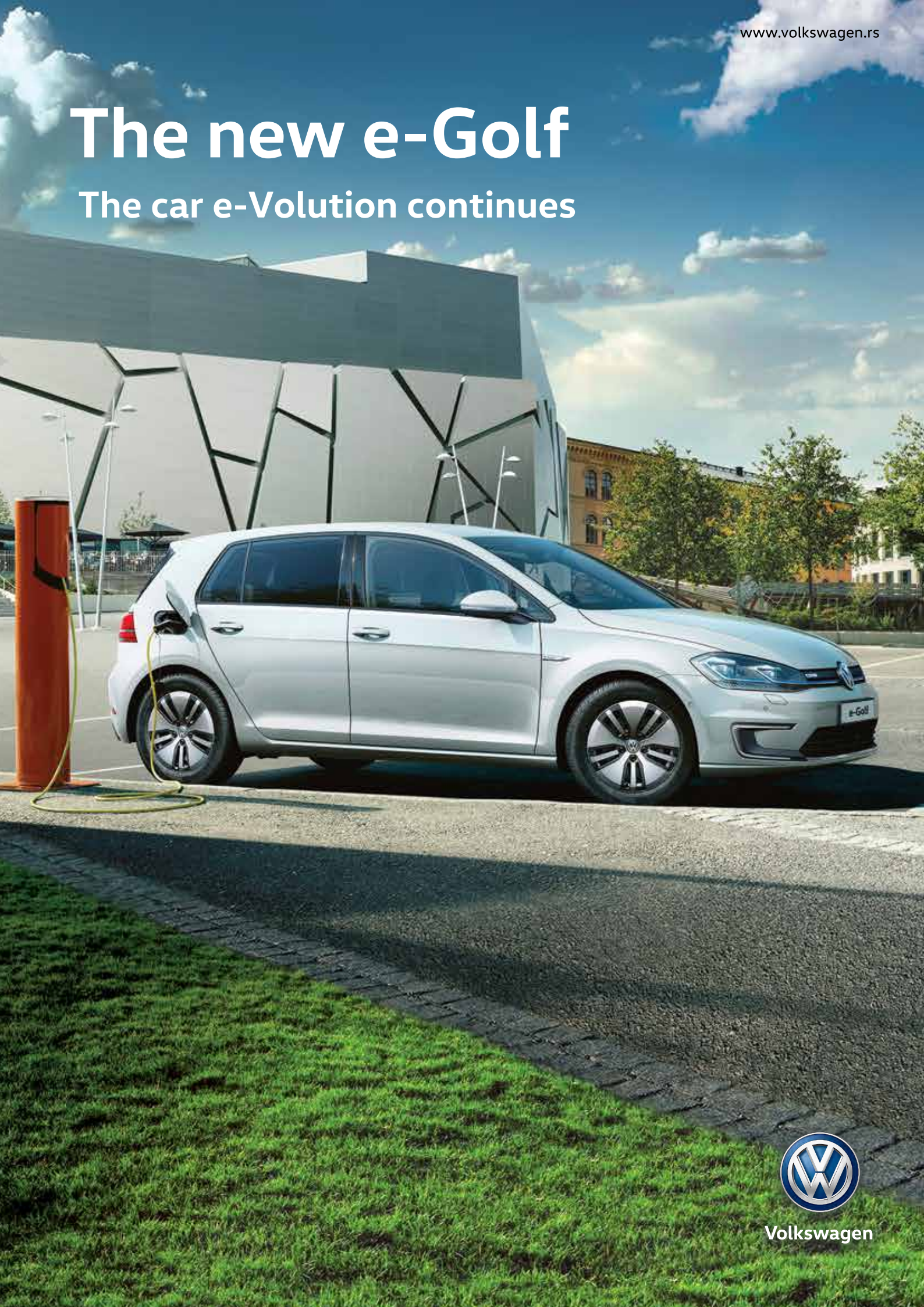
Milan Lazić I would mention here MEB platform and I.D. gamma vehicles whose characteristics are such that competition will have to make efforts in order to respond adequately.

Interview by: Vera Rakić

www.volkswagen.rs

The new e-Golf

The car e-Volution continues



Volkswagen

Rambo Amadeus

Every Gram of CO_2 You Drop into the Air, Your Grandchildren Will Inhale No Matter How Much Money You Leave on Their Bank Accounts

Photo: Facebook/Rambo Amadeus

We are definitely sure that there is no person in this region who hasn't heard of Rambo Amadeus, a great musician, poet and a "media manipulator" as he describes himself.

In the interview for Energy portal he revealed to us how far did he come with his project "Solar Retro Sailboat", why hybrid vehicles are the best choice for each driver at the moment, but also why it is important to preserve the cleanness of the sea, land and air for future generations.

EP You, Rambo, are a great fighter for renewable energy sources and energy efficiency. What do you think why such view of the world is not something that is benevolent in the Balkans? Is it because people here are occupied with mere survival, is it media's fault for insufficient reporting on the benefits of "green approach" or is it politicians' fault? How can we change that?

Rambo Amadeus Well, I definitely have a different perspective of the surroundings. Majority of common people are crying for reducing senselessly high energy costs. Rich Denmark consumes 5 times less energy per household on average, than we do.

On the other hand, owners and resellers of energy resources – the chosen number of people, that every reduction in energy costs directly strikes on their wallet, have a huge impact on government and that is the reason why the things go slowly or are not happening at all.

Common people understand that energy efficiency is good, but it is wrong to expect that the state or large energy systems will deal with that. Ordinary working people should do that by themselves for one simple reason because it pays off. You won't see the commercials on TV for loans for energy efficiency, although the interest rates are much lower than for cash loans and even though all banks need to have them in their offers by the law. An individual must be persistent, he must make inquiries and find out what his rights and possibilities are. Google is an excellent advisor there.

EP We know that your IndieGoGo campaign for modernization of solar sailboat is successfully finished and the targeted sum was collected. But, do you need more money? Has anybody else out of public figures or institutions supported you?

Rambo Amadeus No, we do not need more money. UNDP Montenegro has allocated funds that are sufficient for finishing the boat. UNDP finances the boat until it is launched. We will probably need some funds to give salary to a young and capable skipper and he would be on duty on the boat. But we will think about that when we finish the boat.

I have to mention Montenegrin Telekom, which has been supporting sailing since last season. It helped me restore some legendary sailing boats which are the icons of Herceg Novi. Thus, UNDP finances us till launching and

Telekom has announced that it is willing to help smoothly functioning of the boat in later stages.

EP Can you tell us something about the history of a sailing boat – cutter? On what drive did it move, apart from wind, when it was originally built?

Rambo Amadeus It originally used oars and wind. It was used for the training of sailors and sailing officers in rowing and sailing. It was designed at the end of 19th century and at the beginning of the 20th century you could find it in more or less all navies of the world.

EP How far did you come with the project? How much time (and money) did you spend? Do you and Nenad Bošković have a team of collaborators on the project or are you doing everything by yourselves?

Rambo Amadeus So far we have bought a hull, a boat trough, the original design of naval cutter, but it was made with the best technology – the west system, in the shipyard ENAVIGO Virovitica.

The boat is now in the workshop in Herceg Novi, and the calculations were made by Srđan Đaković, an experienced shipbuilding engineer, specialized in sailing boats. The keel, a completely innovative and original design, was done by Ivan Erdevički, our well-known citizen of Herceg Novi, who has his own office for ships' designing.

We are currently communicating with the Faculty of Technology in Belgrade, they will help us with the hydrodynamics of the keel's sheets and the rudder's sheet, and they will make that out of carbon. We are in parallel communication with the suppliers of the needed elements.

We are making boat cart for the sailing boat, so that we could move it smoothly.

The next stage is "sculpting" of the deck and cockpit. We have to make a model of the boat in a natural size, so that we could have it as I would say "for real". None of 3D models and drawings can help there since you have a completely different impression when you have a model in a natural size in front of you.

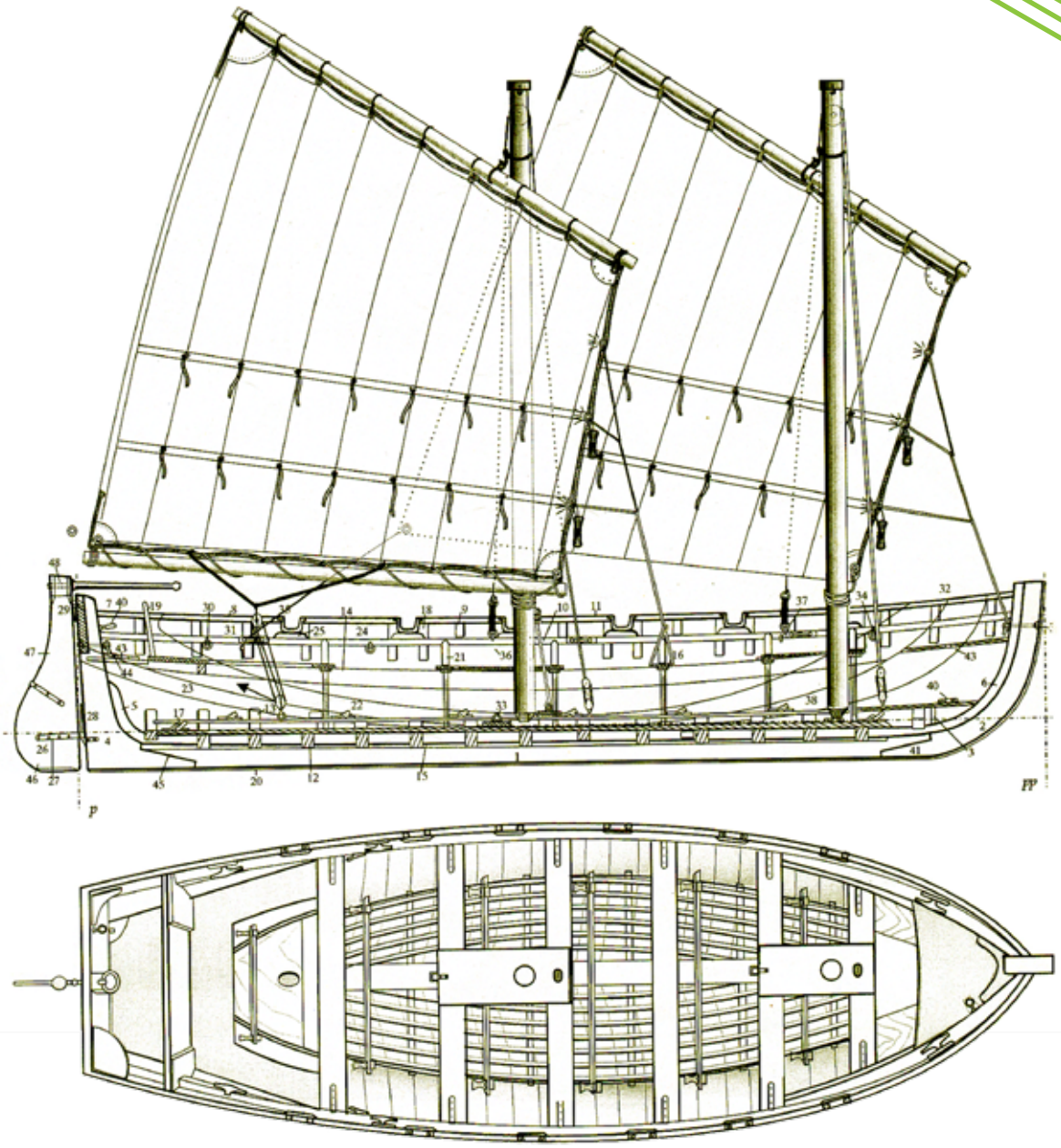
So, now in June we made a model out of hardwood, adhesive tape and Styrofoam. A famous artist and my friend, Darko Vlaović will help us with the visual appearance of the deck, so that it is at the same time classical and retro with modern look and also ergonomic.

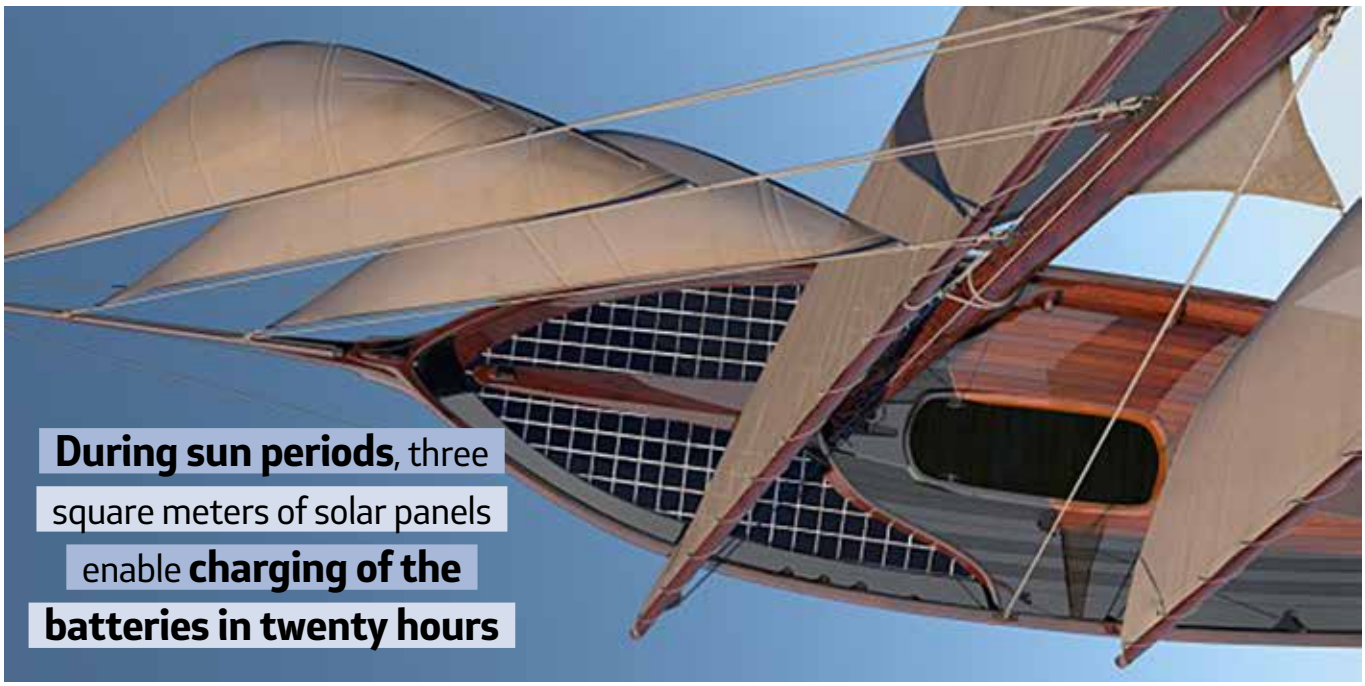
Igor Pjacun will take care of the ergonomics, easy accessibility of the commands, ropes, angles and halyards. He is a famous Adriatic skipper and competitor, a good friend of mine and one of the most experienced sailors I know.

EP As announced, solar retro sailboat should be launched into the sea in spring 2018. You said that it is a good idea to sail around the Bay of Kotor and thus draw attention of

Photo: Facebook/Rambo Amadeus

The idea is to convert all owners of the speedboats and motor boats to sell their vessels to the Third world where everyone still "falls" on the sound of the engine, and that **the entire Bay, Montenegrin coast, but also the entire Adriatic become one silent, clean oasis in which it is sailed silently and completely ecologically.** That is my vision and I know it will happen at some moment, and it is my pleasure to work on the promotion of this idea





During sun periods, three square meters of solar panels enable **charging of the batteries in twenty hours**

Photo: (up) Facebook/Rambo Amadeus • (down) IndieGoGo/Solar retro sailboat

other sailors, but also everyone else on the importance of preserving the sea and environmental protection. But, will the tourists have an opportunity to go for a boat ride?

Rambo Amadeus Definitely. The idea is that after a while, the boat becomes sustainable, commercially used, that it can financially maintain itself and also bring salary for one sailor, skipper.

EP And now a few technical questions. How many solar panels are needed so as to have enough energy to start a sailing boat? Do you have a battery for energy storage? Which one? If you do not have it, do you plan on purchasing it?

Rambo Amadeus The accumulator of 400 Ah runs the motor. The engine power is 5 kW and the system allows the sailing boat to have the navigation autonomy of an hour with the speed of 5 knots.

During sun periods, three square meters of solar panels enable charging of the batteries in twenty hours.

Since the sails and wind are the main drive of the ship and the engine is auxiliary that only serves for setting a sail and sailing into, as well as some crisis situations, 1 hour a day is more than sufficient autonomy of the engine.

EP We heard that you give sailing lessons and that you are trying to convert your trainees to abandon fossil fuels and to switch to renewable energy. How successful are you in that?

Rambo Amadeus I am not the only one who gives lessons. I sometimes give lessons when fans insist, but there is the sailing club "Jugole Grakalić" in Herceg Novi, but also in all other clubs in the Bay in Montenegro, we have top-level sailors who are at disposal to those who are interested.

The idea is to convert all owners of the speedboats and motor boats to sell their vessels to the Third world where everyone still "falls" on the sound of the engine, and that the entire Bay, Montenegrin coast, but also the entire Adriatic become one silent, clean oasis in which it is sailed silently and completely ecologically. That is my vision and I know it will happen at some moment, and it is my pleasure to work on the promotion of this idea.

EP Last year eco-tax in Montenegro for sailing boat was determined by their length and not by the power of the engine, so you paid more than the polluter that have smaller sailing boats, yachts, ships... Has this paradoxical situation changed?

Rambo Amadeus Yes, this is really nonsense. If cars are registered by horsepower, I do not see the reason why the ships are charged by length. It is absurd that the sailing boat and motor yacht pay the same amount.

Motor yacht – speedboat spends from 100 to 5,000 litres of gasoline per hour and those are crazy amounts. Sailing boats of the same length spend literally 10 to 500 times less. So, a litre, two, five per hour and only when using the engine. When they are sailing under the sales, they do not spend anything.

Now, imagine how ridicules is for the owner of the motor yacht, who daily spends 5,000 euros on fuel, to pay 50 euros for berth or sailing permit. Thereat, it noticeably pollutes the sea from which we live. Someone who understands the sea should manage our sea.

HYBRID CARS ARE SEXY

EP You are not only the true pioneer of ecomobility at the sea but also on land. For a start, you drive a hybrid car. What does it feel like?

Rambo Amadeus Yes, certainly. I drive Toyota Prius, to which hybrid technology enables to recaptures the energy of regenerative breaking that is normally lost. The hybrid car has much less mechanical parts than a classical one, therefore there is less to break, it is very reliable.

And of course, it saves money. For example, when I travel from Herceg Novi to Belgrade it spends less than 4 litres per 100 kilometres.

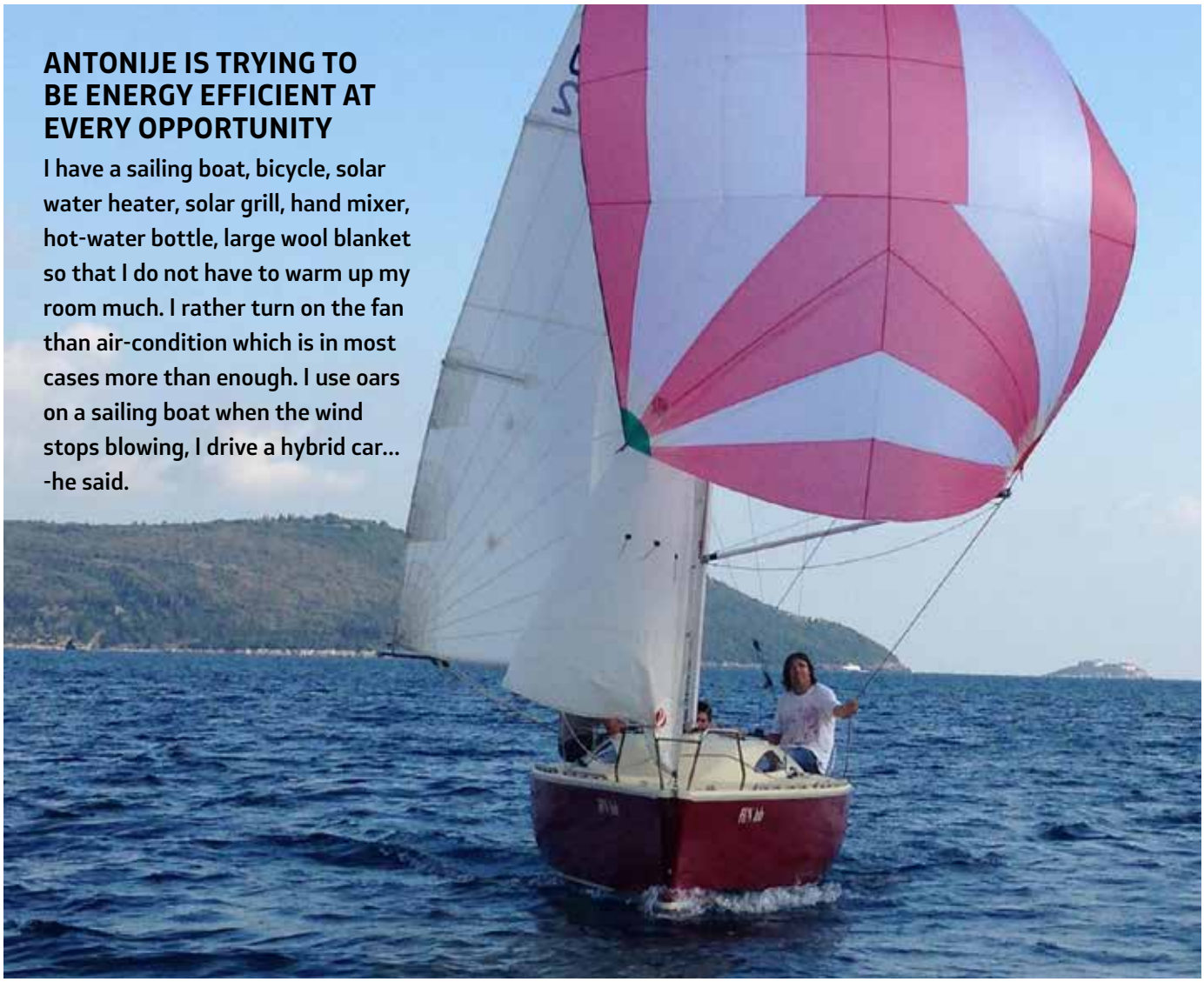
The hybrid car is sexy, it produces its own energy and thus it recuperates through alternator in the wheels the regenerative energy and it puts it back into operation. It is ... an epochal concept

EP Do you plan on switching on electric car? Will you maybe start a new IndieGoGo campaign and turn an old-timer into an electric car?

Rambo Amadeus No, it's a bad idea. The electricity in the grid is dominantly produced from coal. It's dirty energy, dirtier than gasoline. The hybrid car is sexy, it produces its own energy and thus it recuperates through alternator in the wheels the regenerative energy and it puts it back into operation. It is an epochal concept.

A hybrid car does not have huge batteries. Its batteries are relatively small thus the problem with recycling is also smaller. The combination of LNG-gas and hybrid technology is the best of all technologies we can use for our planet.

EP If you would buy an electric car which one would it be? Ten years ago, you said that you bought an electric car in China, is that true?



ANTONIJE IS TRYING TO BE ENERGY EFFICIENT AT EVERY OPPORTUNITY

I have a sailing boat, bicycle, solar water heater, solar grill, hand mixer, hot-water bottle, large wool blanket so that I do not have to warm up my room much. I rather turn on the fan than air-condition which is in most cases more than enough. I use oars on a sailing boat when the wind stops blowing, I drive a hybrid car... -he said.

Photo: Facebook/Rambo Amadeus

Rambo Amadeus I got a "garden" car, but it wasn't for traffic. So, as I got it, I gave it away to "Ada Ciganlija" park.

The main trick is to understand that luxury is the one that pollutes. It is absurd that a man of 80 kg drives a car of 2,000 kilograms. If I were to buy an electric car, it definitely wouldn't be Tesla. That concept is still too luxurious, expensive in economic and ecological sense.

It would rather be a small, light, simple as for example Renault Z.E., economical and simple, without luxury. The luxury pollutes.

EP What do you think about the lack of incentive measures and almost non-existing insurance options?

Rambo Amadeus I do not think anything about the things which do not exist. The incentive measures exist in other developed countries and positive examples should just be copied.

EP Also, people have seen you riding a bike in Herceg Novi. Do you ride it in Belgrade and other bigger places?

Rambo Amadeus Well, in fact, they haven't seen me in Herceg Novi. I go on foot there, because everything is in stairs. I come from Belgrade by car and it stays in the parking lot for days until I go back to Belgrade. I ride the bike in the centre of Belgrade when the weather is nice.

EP Can your position of a public figure change the awareness of people?

Rambo Amadeus Definitely. My words are heard louder than the words of a person who has the PhD in ecology or energetics, because we live in a society that likes spectacles. Just the things that are exposed to the media are considered to be the truth.

Of course, it would have been nice if public figures had an obligation to be socially responsible and to advocate true values in the media. To forget about themselves and their personal aspirations and wishes for a for a while.

EP Finally, do you have any message for drivers/captains polluters?

Rambo Amadeus I do have. Each gram of CO_2 you drop into the air, you grandchildren will inhale no matter how much money you leave them on their bank accounts.

Interview by: Nevena Đukić and Vera Rakić


Sheer Driving
Pleasure
M LY 3587
BORN ELECTRIC.
BMW i3.
Schedule a test drive at www.bmw.rs

IDVORSKY ELECTRIC TRACTOR

Our Idea for a Sustainable Future

The road that Dalibor Marković, Nikola Popov and Ivan Jovanov have passed since the first mentioning of an electric tractor till today is pervaded through struggle, learning, research, satisfaction, enthusiasm and disappointments, delusions and failures, victories and defeats. Everything that one creative process of creating startup and innovation implies

In the current decades, the world is becoming more and more aware of how important it is to reduce the emissions of harmful gases into the atmosphere, both in the field of industry and in the transportation. Also, there is an increase in the number of people who are turning to organic food production, without the use of pesticides and other chemicals, due to their health. But what's the point of the most sophisticated organic seed

Nikola wanted to make life easier for his father by **converting his old tractor into an electric one**

and the minimal treatment of fruits and vegetables, when the soil is processed by agricultural machinery, which emits into the air, ground and water tons of exhaust gases, usually caused by impure oil and other fuels?

Three young men from Serbia – Dalibor Marković, Nikola Popov and Ivan Jovanov – found a way to tackle this problem. They launched a startup project "Idvorsky Electric" and presented a fully electric lightweight tractor on the international competition. Not only is the electric tractor energy efficient, but it is also completely ecological. In our bulletin you have a unique opportunity to get to know the team named by the middle name and the birthplace of our world-renowned scientist Mihailo Idvorski Pupin.

HOW IT ALL STARTED

On one occasion, at the end of 2015, three friends and colleagues from Faculty of Electrical Engineering were lively discussing profession and the future. The spirit of entrepreneurship inherent in their generation and the common desire to engage in innovation, inspired their conversation. The technological world, and especially a part of that world that is close to them, was full of exciting events and novelties. Display of the future that the new technology brings on a daily basis was no longer based only on the picture of the supercomputer, the Internet, smartphones, networked devices, and virtual reality anymore. Burning need for clean

Photo: (from left to right) Nikola Popov, Dalibor Marković, Ivan Jovanov – private archive

The final development, general and detailed design, prototype and product organization of electric tractors **are far away** at this moment. Investing in this kind of projects, even in much more stimulating development environments, **exceed** tens or even **hundreds millions of dollars**

The illustration of Idvorsky electric tractor made by Luka Mitrović, young Serbian designer who lives and works in Californi

CHARACTERISTICS OF THE DESIGNED ELECTRIC TRACTOR MODEL

Type Universal lightweight tractor – the most common type of tractor in use with a wide range of uses and functions

Power up to 60 kW/ Torque: up to 1100 Nm/ Weight: up to 3500 kg/ Specific weight: 50 – 60 kW/kg

Speed range crawling speed 0 – 5 km/h, operating speed 5 -14 km/h, transport speed up to 50 km/h

Drive In wheel drive system 4WD with one or no mechanical reduction Power take-off (PTO) and hydraulic lifting system as independent drives

Battery Basic chemistry *Lithium Iron Phosphate* – LiFePO4, capacity 200 – 250 kWh (which is equivalent to the useful energy of a full tank of diesel engine of the same tractor type)

Powertrain Total average efficiency of the system battery-inverter-actuator, power: 65 – 68 per cent – this efficiency supersedes the relatively low energy density of lithium-ionic batteries compared to fossil fuels bearing in mind that the observed efficiency of diesel tractors is about 20 per cent

Characteristics Low operational costs, zero emission, wide regulation and control of the electric drive, high reliability and minimal maintenance due to minimum number of mechanical parts and low noise emission.

Function of the mobile aggregate *On board* battery of high capacity enables the supply of standard electrical devices and tools on inaccessible terrains without a power supply. Suitable for irrigation and carrying out of emergency work on the ground.

Market niche Organic food production, indoor production systems, vineyards, orchards, urban zones (parks, resorts), national parks and nature reserves.

energy, as well as the awareness about sustainable development, have led to a large specter of innovations their branch – the electric power industry. They were especially fascinated by the electric vehicles development trend, as well as the main protagonist of this philosophy, Elon Musk and the achievements of his company "Tesla".

– Nikola, the newest doctor of science from our company, mentioned during the discussion that frequent problems with old father's tractor on the family estate prompted him to think about the electric version of a light tractor. Soon, his idea got us completely occupied, and wider audience found it very interesting – Ivan Jovanov, one of the three minds of this project, told us.

And with their idea and just a few months of development, as the only team from the region called "Idvorsky Electric", they finished in the final of the eminent startup competition, at the Stanford University, as part of a global entrepreneurial summit, which was personally hosted and supported by the then US President, Barack Obama.

After this great experience and return from San Francisco, we quickly concluded that it is necessary to "pivot" around the original idea that we had taken to America, whose concept was to electrify the existing, old tractors. After deeper acquaintance with this multidisciplinary issue, we realized that, although it is technically possible to process the existing diesel tractors into electric, this type of end product would not achieve economic sustainability nor comparable functional capacity of a standard tractor – said Ivan and continued:

– A modern market requires that the goal of any innovation or technology transfer must be improved product functionality or some features, such as the impact on the environment, and clear economic viability. Electric cars, as pioneers of vehicle electrification, successfully acquired customers. Even those early, expensive versions, although highly unreliable and with the pronounced feature of range anxiety, found their wealthy customers and eco enthusiasts who recognized electric cars as the herald of a sustainable future or a kind of a status symbol. On the other side, the future user of an electric tractor, or any other operation tool, must have undoubtedly economic benefits as the basic condition for considering the purchase and using a product. Of course, there should be no doubts that among farmers there are elitists and those, who are early adopters of changes, but it certainly should not rely on it during positioning the electric tractor on the market.

The whole idea of the construction of this tractor is based on the technology wave advanced for the development of electric cars. However, this variation of the topic of electric vehicles – as well as others that have already come to life along with cars – like electric trucks and buses – requires a complete development and custom design of the new powertrain technology for the needs of a particular vehicle. This challenge would not only involve the engineering of the electric tractor itself, but also a creation review of the entire concept of using this tractor (infrastructure of charging, maintenance, business model, and economics of use, etc.), considering that similar products do not exist on the market yet.

– With our, almost tremendous effort, as well as advice of good people of similar enthusiasm, professionals in the field of agriculture, mechanical engineering and technology, we have succeeded in setting the hypothesis of a sustainable model of an electric tractor, after considerable time spent on researching and working on basic engineering – explains Ivan.

Detailed modeling and complete analysis of the technical and economic sustainability of the concept have become the task of a serious feasibility study. The proportions and width of the challenges of such a project outweigh the power of the three enthusiasts. Only a feasibility study requires a dedicated team of experts of various specialties, organization and means for its development, which are estimated at around 120,000 euros.

– The final development, general and detailed design, prototype and product organization of electric tractors are far away at this moment, considering that investments in this kind of projects, even in much more stimulating development environments, exceed tens or even hundreds millions of dollars – Ivan is real.

The further course of this project is critical and very uncertain, but the Idvorsky team never loses hope.

– Money and other social conditions have to be provided, to meet materialization of this project in Serbia.

Our contribution to launching the spark is certainly not sufficient. However, it has generated valuable knowledge and experience which belongs to the future so that our efforts are not in vain.

Adapted by: Tamara Zjačić and Vera Rakić

Photo: private archive

Milan Belin

The Advantage of Renault Electric Cars is Its Multiple Purpose

The company Renault is the first car company to devote itself to the development of cars with zero emission of CO2. At the beginning of the current decade, the first electric cars – models Zoe, Twizy, Kangoo Z.E., Fluence Z.E. – arrived and expanded the Renault's assortment.

Given the fact that they are equally recognisable, as well as other Renault's vehicles, they are quickly becoming popular on the old continent. However, they still haven't arrived in Serbia, and why that is the case we got the explanation from General Manager of "Renault-Nissan Srbija", Milan Belin.

In order for our electric vehicles to appear on the Serbian market, adequate subsidies are needed when purchasing electric vehicles and a good coverage of charging stations

EP The company Renault has not even one electric car on the Serbian market. Why is that so?

Milan Belin Business model that company Renault presented when launching electric vehicles on the world marker is "electrical vehicles available to everyone". This implies that the company's goal is that each customer gets an electrical vehicle at the price of a similar one with a diesel engine. In order

All photos: Renault-Nissan Serbia

"Renault-Nissan Alliance" represents French-Japanese strategic partnership between mentioned car manufacturers. The companies have been the partners since 1999 and today they have nearly 450,000 employees and they are majority owners of "Renault Samsung Motors" and "Dacia".

In December 2016, the Alliance became one of world's leading manufacturers of plug-in electrical vehicles with global sales of nearly 425,000 entirely electric vehicles, including the vehicles of "Mitsubishi Motors" which is now a part of the Alliance.

Globally, the best-selling electric car of the Alliance is Nissan Leaf and it is at the same time the best-selling electric car in the world of all time, with more than 250,000 sold cars including December 2016.

The situation with the placement of Nissan cars in Serbia is similar to the one with the Renault brand. The first Nissan's electric car will appear on the domestic market when the conditions for that are fulfilled – said Mr Belin.

to achieve this it is necessary to fulfill two conditions: satisfactory subsidy of the government when purchasing an electric vehicle and good coverage of charging stations.

EP What are the things that the developed countries offer to the importers and buyers of the electric vehicles? What condition should be fulfilled in order for the Renault's electric cars to appear in showrooms of some country?

Milan Belin In addition to subventions and availability of chargers, which are the basic conditions for placing of Renault models on the market, almost all developed countries give additional benefits to the owners of electrical cars: free tolls, free parking places, free electricity... Until the Republic of Serbia does not invest in the development of charging network and does not help the purchase by introducing subsidies, there are no adequate conditions for commercialization on our market.

EP Renault Zoe was at the top of Europe's top-selling electric car list in the past few months as well as in the last two years. So far, have you been contacted by the interested buyers of Renault's electric cars on domestic market?

Milan Belin The interest is growing every day, not only for Zoe, but also for Kangoo and Twizy. Aside from individuals,

During 2016, the number of sold Renault models of electric vehicles exceeded 100,000 in Europe, which means that every fourth electric car on this continent is Renault's. In the share of sales, model Zoe is involved with more than 50 per cent, and it is at the same the best-selling model of this kind in Europe in the last two years.

the interest is shown by legal entities, who would like to add this type of vehicles to their fleet.

EP What is the primary reason why customers decide to buy exactly Renault's electric cars? When you compare with the giant such as Tesla, what would be your advantage?

Milan Belin The models which our company produces are multifunctional – from family through city to delivery vehicles, so the possibility to satisfy the wider population is higher.

EP What the fans of Renault's brand like most is certainly the design. The same applies to electric cars such as Zoe and especially model Twizy. What is the secret?

Milan Belin It is very simple – Renault's electric vehicles are fully followed by innovative designer's solutions that are also offered in our other models.

Business model that company Renault presented when launching electric vehicles on the world marker is **"electrical vehicles available to everyone"**

EP What features possess the most popular among Renault's electric vehicles – Zoe, Twizy, Kangoo? What feature is the biggest trump card?

Milan Belin Kangoo has a range of up to 200 km, Twizy up to 100 km. Of course, these are factory data, since the real range depends on the variety of factors (driving style and conditions...) The last modification of Zoe model has a range of up to 400km.

EP On what technical and technological characteristics is the Renault's development sector currently focused?

Milan Belin Renault has decided to develop exclusively electric vehicles in the future and that development is currently going in the direction of cheaper batteries with greater autonomy.

EP For the end, do you have a message for drivers – polluters?

Milan Belin We have only one planet and it depends on us how much will the nature be able to withstand the pollution we create. Look into the future, because we are the ones who influence what kind of planet we will leave to our kids and the future generations.

Interview by: Marija Nešović and Vera Rakić

TURNING POINTOF A DOMESTIC COMPANY TOWARDS ECOMOBILITY

In the last seven years, the Belgrade-based company "MT-Komex" has gradually supplemented and changed its core business, so the employees of this company had the opportunity to enrich the decades of extensive experience in the field of mechanical engineering and welding with new knowledge, by participating in numerous projects for the construction of small hydropower plants, gas power plants and solar power plants. Taking a step forward with modern world trends in the field of electromobility, the company management decided two years ago to make another turn and focus its activities on the development of the application of chargers for electric motors as well as to support the introduction of electric vehicles in transport. Thanks to the introduction of this segment of business on the domestic market, engineers and installers in the company "MT-Komex" have passed through the training and today they can install chargers in residential and commercial buildings as well as in bigger facilities with more demanding infrastructure.

"MT-Komex" has made a strategic partnership with two global companies that are leaders in the production of electric chargers – AC chargers for slow and medium-speed charging from the manufacturer "Schneider Electric", while DC chargers for fast charging are supplied by ABB. Both companies signed a contract that stipulates that this domestic company will be their system integrator. And the results did not lag behind.In the previous period, "MT-Komex" installed chargers for slow and medium-speed charging in BMW, medium-speed chargers were delivered for installation in a public garage on Obilićev venac in Belgrade (three pieces in the first turn) and one device for medium-speed charging which has already been installed in BMW has two charging points, each with the power of 22 KW AC.

As far as the DC chargers are concerned, negotiations with several companies are currently in progress, and the arrangements for delivering chargers to one of the leading companies in the automotive industry, which will install the first 50 kW, model terra 53 ABB at its location in Belgrade, are in the final stage.

As a part of the promotion of the electric chargers for vehicles "MT-Komex" has developed a new web platform at the address elektropunjaci.com, that will have all information on technique for charging electric cars, the electric cars themselves, their offer on the market, quality and autonomy of individual models. Website visitors will also have access to an online shop where they will be able to buy chargers and accompanying equipment for charging electric vehicles. Likewise, the platform will allow clients to submit requests for projects, and the trained installers and engineers in "MT-Komex" will evaluate and access the execution of projects based on the sent data.

The platform will also include links to charger maps, which is a very useful tool for all the users of electric cars. The maps will not only cover Serbia and the Balkans, but also the whole of Europe, and they will able to find every location of public chargers as well as private chargers that are accessible to the public. Thanks to this, electric car users will have all the information necessary for electromobility in one place. The maps will be updated regularly, as "MT-Komex" engineers will register each new charging point, according to the investor's desire, so that data on charging points are visible to all electric car users.

You can find more information at:

www.elektropunjaci.com

Info@mt-komex.co.rs

011 77 04 566

Photos: MT Komex

Aleksandra Đurđević

Although There Are Neither Chargers nor Incentives in Serbia, Drivers Are Thrilled with BMW Electric and Hybrid Cars

At this year's Car Show in Belgrade, Delta Motors not only presented visitors a wide range of BMW's electric, hybrid and plug-in hybrid cars but also decided to place these vehicles on the domestic market.

Many have assessed this as a brave but premature move, as Serbia is still not ready, according to many, for ecomobility.

That is why we chose to talk to Aleksandra Đurđević, General Manager of Delta Motors and find out why "BMW Serbia" team decided to embark on an adventure of placing an electric car on the market.

So far as a company, we are entering more challenging segments such as development of national and local strategy for electric vehicles, because we are here **to offer our clients only the best** from the aspects of innovation, technology, and mobility

EP Why did you decide to sell both electric and hybrid BMW cars in our country? What is your strategy?

Aleksandra Đurđević Delta Motors Company has introduced this special segment of vehicles, which is – in the context of our country – premature, but as representatives of the BMW Group for Serbia and Montenegro, we exactly want to introduce what is already reality in the world, to our country. We are aware that this is the fastest growing segment and that it has the most obvious prospect in the near future, as fossil fuel vehicles will drastically be reduced or completely out of usedue to the pollution standards that are prescribed in Europe and around the world.

Germany decided not to have vehicles with an internal combustion engine after 2030, so as not to cause further pollution. Electric vehicles are present in almost all countries in the region, so we are trying, with the help of foreign partners, to make suggestions and concrete solutions so that this development segment of our market accelerates. The global performance of the BMW manufacturer makes a strong focus on a leading position and we as representatives have no different attitude. We are pleased that our electric cars provoke extremely positive reactions during each test drive.

EP What are the problems that you, as an importer of electric and hybrid vehicles, face in Serbia?

Aleksandra Đurđević The challenges of introducing electric vehicles are not small, as it is the case with most new things in the beginning. We have successfully overcome administrative difficulties and now we are waiting for new

All photos: BMW

tasks – initiatives related to state incentives and infrastructure development.

The two key questions of a client interested in an electric vehicle are whether there are incentives and what the range of the vehicleis. There is plenty of room for the improvement in our country, primarily in terms of benefits for owners of these vehicles and charger network, which are key initiators for the sale of these vehicles and the impact on drivers' awareness.

Of course, the use of an electric car is not entirely dependent on the infrastructure, but it implies that the user has a socket at the place where the vehicle is being charged. With a good infrastructure of public chargers, the importance of this factor will be significantly reduced.

BMW Serbia has initiated the development of a national and local strategy for electric vehicles with the Association of Vehicle Importers and Distributors and we believe that our country will opt for the best practices from the region and Europe and apply them in our country. So far as a company we are entering more challenging segments like this one, because we are here to offer our clients only the best from the aspect of innovation, technology, and mobility.

EP Are people interested and are there any serious buyers? Do some of the interested parties give up because of the obstacles that stand in their way?

THE BAVARIAN MANUFACTURER, in 1972, produced the first electric BMW – 1602e – made its world debut when accompanying participants at the Olympic Games in Munich, so that they would not be exposed to contaminated air during the race. For the next four decades, BMW has been intensively producing prototypes and various models of electric and hybrid cars, and in 2013, two commercial stars – the BMW i3 and BMW i8 appeared, but with an even more ambitious strategy.

Aleksandra Đurđević Clients are extremely interested, regardless of the fact that currently there is neither network of public chargers nor incentives. Today information is available from all over the world and people are well informed. An increasing number of electric vehicles are on the road, which will certainly affect the accelerated development of the infrastructure.

Electric car is currently being bought as a "second" car in the family, the one that you will primarily use for city driving. There are no obstacles for this kind of use because home charger is enough for our customers. BMW i3 has 200 km autonomy and it is important to note that the cost of maintaining such a vehicle is minimal, as the economic factor is a very important item.

Soon it will not be enough for vehicles to have only zero emissions, but they need to be ecological throughout the process

EP What incentives are offered to importers of "green" BMW vehicles in more developed countries?

Aleksandra Đurđević Germany has launched an initiative in front of the European Commission to support the installation and expansion of the infrastructure network of chargers throughout its country, which was adopted by the Commission and prescribed a Directive by which all member states are obliged to develop an adequate charging network by 2020. From this, we clearly see that there is a developed awareness of the importance of introducing electric vehicles in Europe, while the very facts about the number of chargers and electric vehicles in the world speak for themselves.

In Japan, there are more chargers than gas stations, 40,000 to 35,000, in China it is planned to have a network of 5 million chargers by 2020, while in the USA there are programs of big incentives for the purchase of electric and hybrid vehicles.

In our country, this segment of ecology is still not being paid enough attention to, while in developed countries a big emphasis is placed on reducing the emissions of harmful gases while driving. Soon it will not be enough for vehicles to have zero emissions only, but they need to be ecological throughout the process, from production to recycling. In fact, only by using electricity generated in an environmentally sound manner in the car production, can the use of electric vehicles completely make sense.

Even when the region is concerned, we do not lag behind Europe significantly. In Croatia, there is already a developed network of over 100 chargers, and in 2015 they began with state incentives for the purchase of electric and

hybrid vehicles. Fast chargers for all types of new electric cars in Slovenia are located every 50 kilometers, the state provides incentives of 100 percent for the construction of chargers, while the purchase of a new electric car is subsidized with as much as 7,500 euros.

We believe that it is just a matter of time when some of these initiatives will be adopted in our country as well because this is a sure road to ambitious global ecological goals.

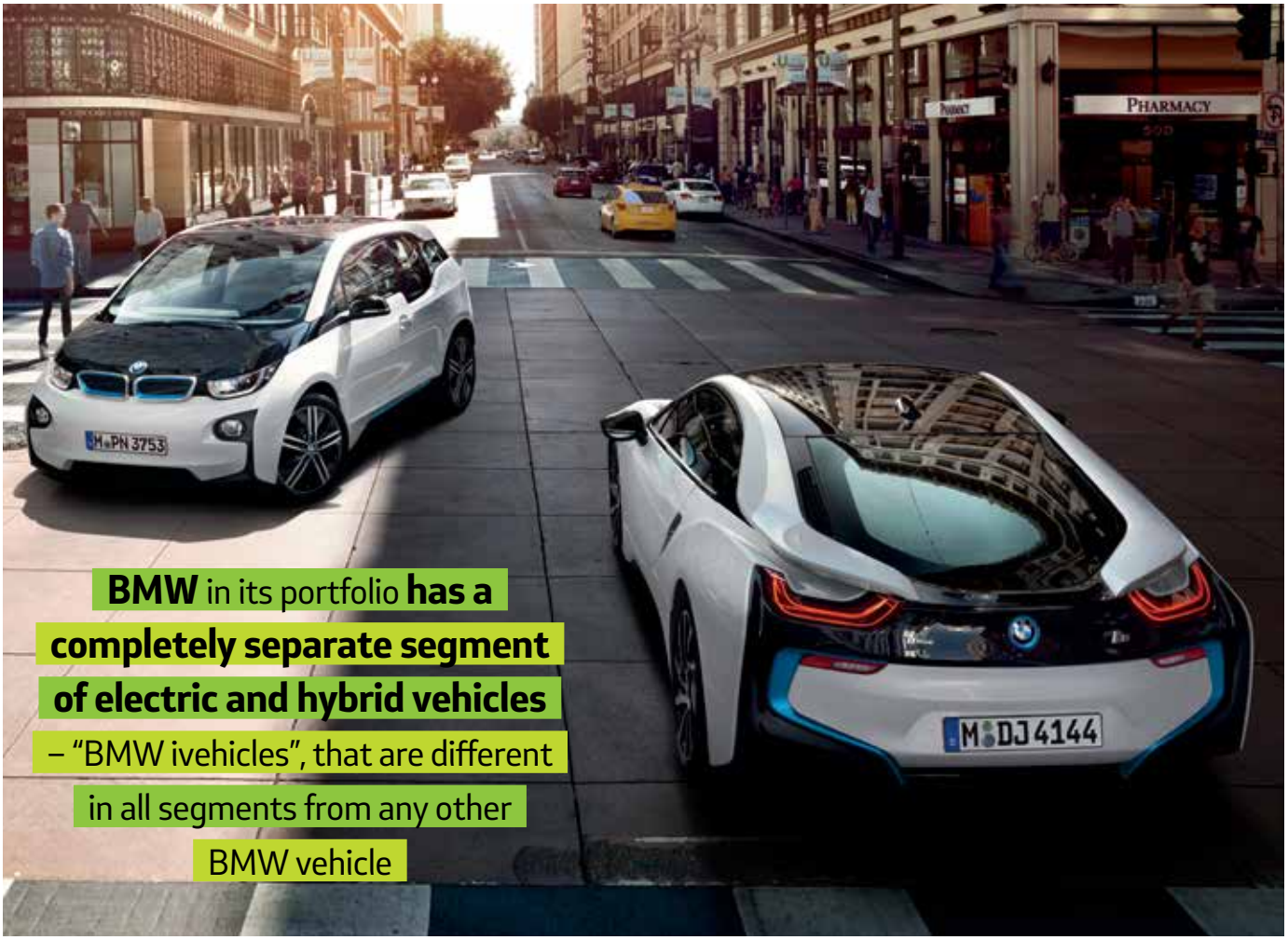
EP Given that the infrastructure of charging stations here is only in the planning phase, what do you offer to potential customers, but also to tourists or business people who have set on a journey in a eco-friendly BMW through our country? Where and how can they recharge their electric vehicles?

Aleksandra Đurđević Chargers will be available to customers in our facilities. Charging vehicles on our network chargers will be free of charge and the owner of a vehicle, in a more favorable mode of power (at night, when vehicles are most often charged), can pay a completely symbolic price. It is also planned that chargers are installed in Crowne Plaza and Holiday Inn hotels, that our dealer network is fully covered and also that the chargers are installed in Delta City and other shopping centers.

EP You have introduced your own electric car i3, plug-in hybrid i8, as well as 330e iPerformance at the fair. Can you tell us more about each one of them? Which model stands out most?

Aleksandra Đurđević BMW in its portfolio has a completely separate segment of electric and hybrid vehicles – "BMWi vehicles", that are different in all segments from any other BMW vehicle. The goal was to move the engineering borders by creating a car that is the leader in "sustainability" from the point of view of environmental protection, whose trump card is not only the zero emissions of harmful gases.

With model BMW i3 the slogan "Born Electric" emphasizes the most efficient ecological car throughout the whole process, starting from production, usage to vehicles recycling. The BMW i3 is the most outstanding model because it represents the future of urban mobility. The vehicle is about 4 meters long and has a spacious interior. Due to its specific design (car body made from CFRP – Carbon Fiber Reinforced Plastic and batteries placed in the floor of the vehicle), it is extremely dynamic and agile. The total weight of the base model is 1,285 kg. It has an electric power of 125 kW and accelerates to 100 km/h in 7.3 seconds. The autonomy of single-charge is about 200 km depending on the mode of use.



BMW in its portfolio **has a completely separate segment of electric and hybrid vehicles** – "BMW ivehicles", that are different in all segments from any other BMW vehicle

The BMW i8 is a model that promotes the new brand in the best way. It provokes excitement with a great sports design. It is a plug-in hybrid and is powered by two engines: 1.5-litre gasoline engine driving rear wheels rated 170 kW and an electric motor powering the front wheels rated 96 kW. The total system power is 266 kW. When both engines work at the same time i8 accelerates to 100 km/h in 4.4 seconds. The autonomy of the movement in the electric mode is about 30 km and the total is about 440 km. The shell is like the model i3 made from CFRP and the total weight of the vehicle is about 1500 kg.

The 330e is a representative of a special BMW 330e sub-brand to which hybrid cars belong, which are electrified versions of conventional vehicles. The current gamma consists of 225xe, 330e, 530e, 740e and X5 xDrive 40 e. Series 3 is one of the key BMW models and has got its PHEV version. This model is series hybrid and its drive consists of a 135 kW diesel two-litre petrol engine that transfers power to the wheels via an eight-speed gearbox with an integrated 65 kW electric motor. The total system power is 185 kW. Acceleration up to 100 km/h reaches in 6.1 seconds and the autonomy in the electric mode is up to 40 km.

An interesting feature of the current hybrid models is that there is a choice of driving mode, so by using the eDrive button, it is possible to activate "Auto mode" which means the use of both engines according to the driving conditions. "Save mode" activates the drive on the ICE and uses every opportunity to recharge the battery with regenerative braking. The third type is "E mode", that is, driving exclusively on the electric drive.

EP Many manufacturers of electric vehicles have a problem with battery production technology, tell us about the capacities of your batteries. What does BMW's plan to introduce in this field?

Aleksandra Đurđević Since the beginning of the electrification technology, the battery has changed considerably. In the current era of electrification, the first hybrid model was the BMW X6 active hybrid and it used NI MH batteries with which it could only cross 2-3 kilometers in the electric vehicle mode. The current batteries are Li ION. They are made from segments and their reparation is possible by replacing components. Certainly, innovations are primarily reflected in the increase of their capacity, which will affect the increase in autonomy.

EP What does BMW prepare new when it comes to e-mobility? What models and what features can we expect in the years to come?

Aleksandra Đurđević By 2020, BMW plans to have more than 30 models in its range with some sort of electric drive. Completely electric vehicles should have the autonomy of about 500 km. By then, some of the BMW conventional models will appear in completely electric versions like the electric X3.

Achieving great autonomy is not a problem at this moment, it is only necessary to install larger batteries, but they would drastically increase the overall weight of the vehicle so that the characteristic BMW driving dynamics would be lost. I believe that the advancement in the construction of batteries will be such that it will be possible to retain our essential "DNA" characteristics and at same time increase the autonomy.

EP And in the end do you have a message for drivers-polluters?

Aleksandra Đurđević Schedule a test drive with an electric car, I guarantee a unique feeling of driving.

Interview by: Vera Rakić

Saša Cvetojević

Tesla is Much More than a Car, It's a Technology on Wheels

With a successful Croatian entrepreneur, Saša Cvetojević we talked about Tesla, the most popular electric car in the world, his last year's travel through Europe with Tesla, this year's participation in the EV Trophy and also about the difference between the vehicles with classical and electric drive

Saša Cvetojević established his first company Insako for transport and logistics, which he is still successfully leading, when he was 18. He is one of the younger Croatian millionaires and he often invests money in good ideas and companies. He graduated from Faculty of Economics in Zagreb, and after that he finished postgraduate studies in healthcare management at Medical School. He belongs to the most influential people in Croatia who constantly points out the things that should be better in the country through media and social networks.

An extensive book could be written about his successes and examples of good practice and we asked him to share with us part of his experience in terms of electric cars

EP Given the fact that three years ago, you were the first owner of Tesla in Croatia, can you tell us why did you pick precisely this car?

Saša Cvetojević I chose Tesla because it was more than the car itself. It is still valid today. Tesla is a sort of "statement" of the time that is coming. It's a technology on wheels. The fact that it is an electric car is just the beginning of the story but definitely not the end of it. Electric cars, apart from being far more efficient in use, significantly less pollute the surroundings and enable complete change in the concept of utilization and use of cars. They influence the creation of entirely new eco system.

EP How developed was the charging network in Croatia at the time you bought the car and is it better now?

Saša Cvetojević When I bought the first Tesla there were just a few chargers, a little bit more than you have now in Serbia. However, one should bear in mind that every socket is a charger for an electric car. It's just the matter of charging speed, but there is also a lot of prejudice in this regard. Today in Croatia we have three Tesla's superchargers, one is about to be opened and the other two are under construction. In addition to that, we have twentyish Tesla's Destination Chargers and around 200 of other chargers of various power. There are no fast chargers on the highways that would enable other electric cars to cross longer distances. Slovenia is a good example there, since there are fast chargers on most of the gas stations on highways.

Photo: private archive

EP Is eco-mobility still a privilege of the rich?

Saša Cvetojević No, it's not. I know a lot of people who converted their cars into electric ones, from fiat, to even beetle or trabant. Now they drive them around the city or on shorter intercity routes and it is very profitable. Tesla is a high-class car, but the arrival of new models in the middle class is becoming more than apparent. In two to three years, I expect huge changes in middle and lower price class of electric vehicles. Assuming that the price of batteries will drop at a pace that is already noticeable, as well as the development of the fast charging network in the next few years an electric car should even be cheaper than a comparable car on "classical" drive.

EP Does it make sense to drive an electric car in Croatia given the fact that almost 50 per cent of energy comes from thermal and nuclear power plants?

Saša Cvetojević Of course, it makes sense. Even if 100 per cent of energy comes from thermal power plant, the consumption efficiency of electric motor, with the use of electricity in "off peak" periods in which the grid anyway has the surplus of electricity, is a good solution both ecologically and financially. Still, we should look a little bit into the future. Renewable sources have a growing share in the production, and the Tesla itself guarantees that the entire electricity they deliver to their superchargers is exclusively bought from those that produce energy from renewable sources.

Electric cars, apart from being far **more efficient** in use, **significantly less pollute the surroundings** and enable complete change in the concept of utilization and use of cars

EP Can you as a successful and public figure influence the attitude of ordinary people?

Saša Cvetojević Of course, and I see that every day. People are writing, asking... They are changing some of their habits if they have someone who can testify and share experience from their personal example. Since I do not have any business agreement with Tesla, I have never received a cent from them and that there is no chance that will happen in the future, I do believe that everything I write and do is fully credible. Simply, I believe that electric cars are the future and we who have more money and certain impact should show this by setting an example and not just words. For example, we who are the first users, have paid those cars much more than they will cost later. We paid and we are paying the development costs from which later, with an expansion of the number of manufacturers and models and the economics of scale, will arrive cheaper and more available models.

Photo: private archive

WHO IS SAŠA CVETOJEVIĆ?

Saša Cvetojević is a successful entrepreneur with many years of experience in health sector, mobile telecommunications and distribution of consumer goods. He is owner and co-owner of several companies and health institutions that operate on Croatian market. He is an expert in human resource management, managing projects and health institutions, as well as in business negotiations. During previous investments, he gained experience in presenting projects to investors on the markets of European Union and United States of America. Some of the projects he invested in have already grown into affirmed companies on domestic and foreign markets. He is the member of the Croatian Employers' Association, as well as of the Croatian Society for Pharmacoeconomics and Health Economics. Five years ago he launched ZIP – Zagreb Entrepreneurship Incubator, in cooperation with three other founders, where he works on mentoring and helping young entrepreneurs.

Photos: Tesla S and Tesla X, Wikimedia/Steve Jurvetson; https://www.flickr.com/photos/jurvetson/21954222146/in/datetaken • Tesla Roadster 2.5; Wikimedia/Mariordo; https://commons.wikimedia.org/w/index.php?curid=14709997

DEVELOPMENT TIMELINE OF A LUXURY ELECTRIC

1888. More than a century ago, Serbian scientist Nikola Tesla, after whom this company got the name, designed AC asynchronous engine that could act as a power generator, and precisely that motor with the same parameters, Tesla's engineers have used in the production of their first cars

2003. Tesla Motors, the company that among other things produces electric cars was established in Silicon Valley, in California. The first Tesla's model Roadstar, an electric sports car that was able to reach around 395 km with a single charge. So, this is how the new standard in electromobility has been set up

2012. Tesla started the production and sales of model S

2013. This limousine was declared for one of the best cars ever made

2014. Started the production of the model X, that is a compacted SUV vehicle

2018. Tesla CEO Elon Musk announced the production of the model 3 that is going to be a city car with a more affordable price in comparison to the previous models

Renewable sources have a growing share in the production, and the Tesla itself guarantees that the entire electricity they deliver to their superchargers is exclusively bought from those that produce energy from renewable sources

EP Last year, you went on a journey through Europe with your Tesla S and you crossed around 10,000 km. Did you have any difficulties while traveling? Did you have any problems when charging your car apart from Serbia?

Saša Cvetojević I did not have any serious problems in Serbia. The only problem was the lack of chargers, so, for example, I had to stay in Niš for five hours due to charging, even on a bad charger I would need around two and a half hours. When Serbia gets its first Tesla's supercharger (out of 3 foreseen), which is realistic to happen in 2018, it will be enough to stop for 20-30 minutes somewhere around Belgrade and as much in the vicinity of Niš and it will be enough to cross the entire Serbia.

As for the traveling from one end of the Europe to another, I wanted to show that you can cross long distances with an electric car even go through the countries that do not have a sufficiently developed charging infrastructure. We had smaller problems in Turkey and to my surprise in the north of Norway. In Turkey, I did not expect this, since I came to the location that was taken from the official map of their largest charging operator, but the charger wasn't there. In Norway I relied on the charger that is maintained by Tesla Club Norway, but it turned out it didn't work. Then, I found out that my cable, which comes with the car and enables the charging on various sockets, for example, schuko or three-phase, does not work in Norway. They (and Albania) have a different way of connecting at low voltage and for those countries, you should have slightly different connection cable (that is electronics on it). However, we solved everything by finding one Tesla's owner through Facebook and he allowed us to charge the car with a suitable cable in his garage.

Through the whole Western Europe where you have the network of Tesla's superchargers and a few independent networks of fast chargers, the trip is completely comparable to gasoline or diesel car. On every three hours, you make a break of 20-30 minutes and charge your battery to 80 per cent and you move on.

EP The EV Trophy competition in which you took part in finished and you won a prize for Fair Play. Can you tell us something more about this competition?

Saša Cvetojević The competition itself is designed as the promotion of electric cars. Renault Zoe, which surprised me, with its range as well as with the speed it developed with three passengers and the luggage, and BMW i3 took part in this competition. In every city in which we had a break, we had an organized reception on the main square, a meeting with mayors and local owners of the electric cars. When we were leaving Copenhagen, the Danish prince Joachim saw us off, and in return we were welcomed by Albert the prince of Monaco. Prince Albert and his foundation are great advocates of green energy and sustainable development.

EP What message do you have for drivers - polluters?

Saša Cvetojević I wouldn't divide drivers into the polluters and the others. Each transport has its own amount of resource that it spends. It is important to at least think about it. Of course, we should use the resources in the best possible way. Besides, I wish that more people would have the opportunity to try electric cars, since that is the easiest way to convince people of how much is the electric drive superior to the one they are used to. When the total driving experience is added to that, plus the possibility of charging the car on a regular socket, in a garage or even in front of a residential building, and the total expense of travelled kilometres that is 7-10 times less than they are accustomed to, some will seriously consider the possibility of buying an electric car.

Interview by: Nevena Đukić

Photo: private archive

Nikola Rajaković

Will Conventional Energy in Serbia Be Able to Respond to the Challenge of Electromobility?

It became clear to all of us that the Republic of Serbia is seriously preparing for the transport transformation – from traditional fossil fuels vehicles to sustainable electric and hybrid cars, buses, trucks.

The network of charging stations in Serbia has started developing rapidly this year. As road infrastructure will soon no longer pose a problem for electric car drivers, it is expected that by 2025 there will be 100,000 such vehicles on the roads in our country.

Benefits arising from the above-mentioned changes are multiple, but for the use of power distribution grid for the purpose of charging batteries of electric vehicles, the good will of drivers, to replace the existing vehicles with more modern electromobiles, is not enough.

We talked to Nikola Rajaković, Ph.D., Professor at the Faculty of Electrical Engineering, the University of Belgrade and one of the leading experts in electrical power engineering in Serbia, about the capacities of our power distribution grid and the impact of the wide use of electric vehicles on its undisturbed operation. He gave us his predictions on the development of sustainable transport and infrastructure for electric vehicles in our country.

– Community of experts in Serbia to a large extent supports the transition of the energy sector towards the energy without fossil fuels, i.e. without the emission of harmful greenhouse gases. At the beginning of these changes there were some open questions, but today it is certain that conventional energy can not respond to the challenges it faces. These challenges are mainly reduced to major environmental problems, the limitation of fossil fuels (oil, gas, coal...) and a steady increase in energy demand – said Rajakovic, Ph.D.

Possible answers lie in the optimal energy mix (hybrid energy solutions with renewable energy sources, energy efficiency, energy storage).

– In such complex energy systems, the need for the introduction of smart grids becomes primary because it is necessary to integrate renewable variable production (primarily from solar power plants and wind farms) in the system in the best possible way. In addition, smart grids

Photo: (above) private archive • (below) Pixabay

enable the flows of energy, gas, and heat to be monitored and controlled and, if necessary, stored, and allow electric batteries to be integrated in the best possible way in the power grid – explains the Professor.

In the curricula at the Faculty of Electrical Engineering, technologies and ways of integrating renewable energy sources have been studied for almost two decades, and in parallel, smart grid technologies have also been introduced.

– The strategic importance of electric vehicles and energy infrastructure for charging electric vehicles in the context of modern energy is enormous. Namely, a large part of the open issues of modern energy and in particular, electricity is solved through the massive introduction of electric transport. In this way, the issue of energy efficiency (as one of the most important levers of modern energy) and the total energy needs is solved very successfully. In the context of widespread use of electric vehicles, it is important to adjust our regulations because a large number of charging station appear, and thus electric transport becomes definitely a new area for which the high technological level of smart power grids is again needed – added Professor Rajaković.

We also learned that within the University of Belgrade, they identified the needs for studies which would examine and prepare the power distribution grid for the upcoming increase in the use of electricity for the purpose of charging vehicle batteries.

– The connection of electric vehicles involves the analysis of two options. The first refers only to the possibility of power flow from the grid to the battery of the vehicle, and the second to the possibility of two-way power flows, that is, the battery can serve both as a consumer and as an energy source. This second option provides the opportunity for the grid to have the backup sources in electric car batteries in case of need and in this way energy storage in significantly diversified. However, it is important to note that simultaneous connection of a large number of batteries to the power grid can bring significant technical problems (voltage drops, higher harmonics...), but these problems can be successfully solved by using optimization algorithms. New load in grids, along with distributed variable renewable energy sources (solar and wind) will require additional development of methods based on stochastic laws in order to successfully integrate in the grid – explained Professor Rajaković.

Photo: Pixabay

Feasibility studies in several scientific research institutes, as well as in Elektroprivreda Srbije, are in the pipeline, and we hope that future research will provide full support to sustainable transport in Serbia.

Prepared by: Marija Nešović

The e-Volution of vehicles continues.

WOULD YOU TRY OUT AN ELECTRIC VEHICLE?

When it comes to vehicles of the future, most people will immediately think of electric cars. The reality, however, is different. In fact, electric cars are already part of our present.

Nowadays, the interest in EVs is growing on many markets, Serbia included. Besides environmental protection and more economical charging, there are numerous reasons for purchasing EVs, some of which are presented below in further detail:

- These vehicles provide quiet operation and do not add to the noise pollution.
- There is no tailpipe emission and no air pollution due to smog.
- Flexible and easy charging. You can charge your vehicle at work or at home – all it takes is to pass a cord through and connect it to a socket.
- Fewer repairs resulting from reduced likelihood of a mechanical failure.
- Easier to maintain.
- Improved cost-efficiency in the long run.

Second generation electric Golf cars, now based on the improved existing seven series, can already be seen on the roads in this country. Improvements have been made to a number of features: battery power is declared to the level of 35.8 kW/h while the aggregate power is increased to 100 kW, which can be easily converted to 136 hp. On the basis of these performances one can very easily determine the realistic driving mileage, charging time, and of course the price of consumption.

e-Golf can now run for **over**
200 kilometres in everyday drive
on a single battery charge

With electric energy everything is strictly defined, and the power of an electric engine in kw equals the product of voltage (220 V) and electricity (A). With a 10A charger it takes a modest 2.2. kw of power, but also almost 18 hours of charging time, to reach the full capacity of 35.8 kw. A more powerful charger will reduce this time proportionally to its power and amperage; thus with a 40 kw charger your e-Golf may be "ready to go" within 45 minutes.

Users largely drive by day and recharge their vehicles overnight, at reduced rates. The cost-efficiency of e-Golf

Photos: Volkswagen

can be demonstrated through the following example: the 10A charger, which comes as a part of an e-Golf package, takes roughly 10 hours to charge to full battery potential, using up about 25 kW/h of electric energy. A simple calculation shows such charging will end up costing us a total of 125 dinars or 1 EUR. The additional advantage is that daily charging requires only a regular power socket.

As for the annual average, which is relevant for all users, e-Golf can now run for over 200 kilometres in everyday drive on a single battery charge, depending on the driving style, use of air conditioning and other parameters. Quality driving enthusiasts will also be interested to learn that e-Golf can accelerate to 100 km/h in 9.6 seconds.

It is particularly interesting that e-Golf lost none of its driving comfort or the signature design. The LED headlights, characterized by low electric energy consumption, enhance its appearance with a new, technological flair. Blue designer elements and aerodynamic optimization provide it with additional standout features.

Numerous advantages notwithstanding, there are real constraints that continue to slow down the popularization of the concept of electrical mobility. One of them is the price, which remains relatively high at the moment of purchase. Given that cost-efficiency of e-vehicles is far higher compared to conventional vehicles, the starting price of e-models should not be directly compared to the equivalent standard models. The price of e-Golf models starts at €40,000.

Building a network of public charging points in Serbia is a project well under way and particularly contributed to by the company Porsche SCG, the authorized representative of the Volkswagen brand. Always ready to get involved in a project of this type, they have placed a charging point for EV users on Zrenjaninski put 11, the location of Volkswagen authorized dealership and service centre Porsche Beograd Sever. ■

Milan Manojlović

An Electric Bike is an Ideal Means of Transport for Those Who Live and Work in the City

The team „E prime“ is a proof that with a good idea it is possible to make an energy-efficient product, which will delight domestic customers in the first place, and then the whole world.

When you ask people what is their favorite means of transport for shorter destinations, many will say it's a bicycle. When you are on a bike, there is no crowd in transportation, there is no waste of time in looking for a parking lot, you can go almost anywhere, and the enjoyment in driving and the benefit of physical activity is immeasurable.

Nevertheless, the bike is mostly used for recreation, but not for going to work. Truth be told, it is not really appropriate to show up at your workplace sweaty and breathless. However, if you have imagination and entrepreneurial spirit, with a little knowledge about technology, you will overcome this problem. Simply, you will make an electric bike!

Exactly with this vision, a team of young people gathered around the project E prime got to work. A successful domestic brand was created out ofthe first modified electric bikes. Milan Manojlović, one of the members of E prime team, told us more about these modern city bikes.

EP It seems that even regular bikes are not popular enough in our country. How come that you became interested in electric bikes? Who came up with the idea that e-bikes are the right thing? Were you driven by love for bicycles, innovations or simply a good feeling for business?

Milan Manojlović Considering that we live in Belgrade, where it is becoming harder every day to drive and find a parking place, and by ordinary bicycle, we could not go to work because we would arrive flushed and breathless, which is certainly not accepted in business environment, we decided to do something.

Since everyone on the team is a big fan of both bicycles and all other vehicles, we have made a few experimental electric bikes out of enthusiasm, so that we, ourselves can use them for everyday needs and reduce transportation costs.

Three years ago, we made our first models and then we started to have problems with being late for work. And not because of traffic jams or parking, but because other traffic participants often stopped us and inquired about the bikes we drive.

Then we realized that we had to get serious and start producing electric bikes. Of course, model development and testing, as well as the production of tools for production, lasted for almost two years.

EP Tell us more about E prime bicycles. For starters, they are equipped with everything and they are easy to ride. But, is it difficult to carry them up the stairs?

Milan Manojlović E-prime bikes are designed, constructed and manufactured in Serbia. In order to adapt them to the needs of customers, we have designed a wide range of equ-

All photos: „E prime“

ipment and options, so that our bikes can be used for both recreation and daily needs, as well as for business purposes.

Customers are most often interested in starting a bicyclewith a fingerprint, GPS tracking, alarm, hydraulic brakes...

Our bikes can be carried up the stairs, but it's certainly easier to use the elevator. It is possible to remove the battery from each model and charge it in the apartment, without the bike itself, so in many cases, you do not need to carry it up the stairs.

Likewise, our bikes can be charged in an hour.

EP Which model is your main product? How fast is it and what is its range?

Milan Manojlović Our main model is eXperience. We can boast that we havea unique design, that has not been seen at any world's manufacturer. Depending on the choice of the engine and the battery, it can travel at a speed of as much as 70 km/h and have a range of up to 200 km with only one charging.

We could not go to work by ordinary bicycle because **we would arrive sweaty and breathless which is** certainly **not accepted in business environment**. That's why we made electric bike.

EP Are the E Prime bicycles made for driving around the city or outside the trails?

Milan Manojlović The models that are currently on sale are designed primarily for city driving, but they can also be driven on moderately difficult paths outside the road.

EP The development of the electromotive industry is largely slowed down because of the battery. How did you solve this problem?

Milan Manojlović Batteries in our bicycles are manufactured according to the required capacity, from small lithium-ion cells of renowned manufacturers. Batteries have a lifetime of 800 charge and discharge cycles up to 75 percent capacity, which is guaranteed by several seasons of usage. After the predicted number of charging, the batteries can be used in accordance with inherited capacity. Also, it is possible to buy a spare or other battery in our company.

It is possible to charge batteries with a standard charger, quick charger or via SDS (Solar Docking Station).

Likewise, all our models are equipped with regenerative charging of batteries, that is, the charging of battery when

braking, which depending on the terrain can extend the distance up to 20 percent.

EP It seems that you have thought it all up, even that the battery should not use the energy generated from fossil fuels, but from renewable energy sources, so you have designed solar charging stations. Tell us something about them.

Milan Manojlović Considering the fact that the price of charging a battery is between five and ten dinars, we wanted to make a product that will allow bikes to recharge completely free of charge.

SDS (Solar Docking Station) on a sunny day enables to charge one to three bicycles (depending on the capacity of the installed battery in the bike).

Also, apart from charging by using a smartphone and application, you can leave a bicycle locked at the charging station to charge and monitor the status of charging.

EP Must a bicycle be charged at the solar station during the day or the station has a system for energy accumulation?

Milan Manojlović Solar station has its own local batteries, so it is possible to charge the bike at night.

EP How many bicycles can be charged at the same time? Are the stations dedicated only to E prime or can others charge their batteries?

Milan Manojlović The model that was made is only for one bike (charging and locking), but according to the order, we can produce a station for several bicycles, without restriction.

At present, the station is adapted for E prime bicycles, but it can be adapted for other bikes and electric motors.

EP You have announced that you will soon launch electric tricycles. Who are they intended for?

Milan Manojlović Tricycles are primarily intended for entrepreneurs. There are two models on the same CHASSIS. One version is intended for courier services and the other is designed as a taxi service for the city center, pedestrian zones and for sightseeing.

EP E Prime bicycles are not only energy efficient but also smart. Tell us what they can do and what kind of innovations distinguish your bikes.

Milan Manojlović Some of "smart" features that bicycles have are: fingerprint start, board computer, USB connector for charging, GPS tracking, remote control alarm, alarm with remote start...

There is also an application for mobile phones, where all parameters can be monitored, not only on the display but also on the mobile phone.

EP How come that you dared to start a business in our country? Was the investment cost-effective?

Milan Manojlović My partners and I have been entrepreneurs for years, so there were not any big and new surprises in the whole process. As far as the cost-effectiveness is concerned, in addition to unusually large number of orders we receive, we have great support from the entire public, which gives us strength for further challenges.

EP Who are your main customers, our people or foreigners? It is certainly not easy to break through the international market side by side with famous brands.

Milan Manojlović For the time being we sell bicycles in Serbia. We have enabled our customers to buy our products through interest-free loans, with the installment less than 50 euros.

We have several invitations for foreign markets, both because of design and price, but we had to postpone agreements for the next season because of the local market demand.

We are currently preparing the export documentation, as well as the certificates required for placing products in the EU.

EP What do you think of the infrastructure of bicycle paths in our country, first of all in Belgrade, where you, too, often drive?

Milan Manojlović Each season there are more and more paths and we are very happy about it. Apart from that, the law allows bicycles to move along the road (except for the highway) so that anyone who really wants to ride a bike has no obstacles.

EP And, in the end, do you have a message for drivers-polluters?

Milan Manojlović Several European countries have decided to ban the sale of internal-combustion engine vehicles in the period from 2020 to 2022. Consequently, polluters will not have a lot of choice, but to adapt in a timely manner, otherwise, they will probably have to pay high taxes.

Of course, the main problem here is the fact that there are only a couple of chargers for vehicles in our country, while for bicycles or motors it does not pose a problem because they can be charged on any standard household socket.

Interview by: Vera Rakić

The leaders in the development and production of trucks and buses with alternative propulsion systems

Natural gas, biogas, and electricity accumulated in batteries are just some of the energy sources that the world-famous manufacturer of commercial vehicles uses to replace fossil fuels with increasing success, thus achieving a double effect: reducing exploitation costs, and leaving a far lesser impact on the environment.

As early as the eve of the first energy crisis in the mid-1970s, in Volvo Group they presciently concluded that the cheap crude oil era was coming to an end, that in time there would be less and less of it, and that the "black gold" burning products would increasingly and abundantly pollute the environment. That's why four decades ago, in the development departments of all members doing business under the Volvo brand, they started conducting extensive experiments with propulsion systems that could replace the "classics" in the foreseeable future - above all, high power diesel engines.

Based on intensive laboratory development and numerous exploitation tests, in Gothenburg, they concluded, much like their competitors, that natural gas (methane) was the most economical, and in terms of the quickest implementation the most apparent replacement for diesel. Apart from the large quantities (according to unconfirmed research, the world reserves are enough for the current consumption for a period longer than 400 years), the fact that it is several times cheaper than other fossil fuels, and that the infrastructure for using it is more and more developed and geographically widespread, one of the most important advantages is that the products of its combustion have little effect on the environment.

With such "features", natural gas in compressed or liquid state is a very good alternative fuel that Volvo recommends for the operation of city buses, and more recently, for the operation of distribution-utility trucks. For example, in the latest generation of medium-sized FE trucks, primarily designed for regional and local transport, Volvo Trucks, in addition to the most modern diesel engines, also installs a 320 horsepower aggregate that burns compressed natural gas.

The "gas" engine emits such a small amount of solid particles that it does not even need a soot filter. This means that no other exhaust gas cleaning systems are required, nor any other auxiliary agents, such as the AdBlue agent. When using bio-gas, the Volvo FE CNG emits as much as 70 percent less carbon dioxide in the atmosphere (CO_2) compared to the same truck with a conventional diesel engine. The customers are offered the option of installing eight or six tanks for

All photos: Volvo

compressed gas on the "gas" truck chassis, which allows working autonomy of up to 400 km in light distribution of goods, and up to 250 km in the difficult collection of municipal waste. According to the load features and standard equipment, the natural gas truck is practically identical to the "twin" that burns diesel, but with significant advantages - it is more economical and eco-friendly than a typical "oiler".

According to estimates by Volvo Trucks' development experts, natural gas has great chance as "supplement" fuel as well, which will make conventional diesel engines more economical, but above all ecologically "more suitable", which means less polluting. For over ten years, Volvo has been experimenting with systems that inject up to 25 percent liquid methane or biogas in conventional diesel engines. When a specially adapted diesel engine burns liquid methane, carbon dioxide emission is reduced by 10 percent, and when biogas is used as a supplementary energy source, this reduction can be as high as 70 percent.

Volvo Trucks also has high expectations from biogas, which can be obtained not only from biodegradable waste (plant mass-forest residues, fruit and vegetable residues in the food preparation process, manure), but also from by-products of some industrial plants. For example, to move a single version of a solo truck from its heaviest family, FH, Volvo used biogas produced from black liquor, which was a by-product created in the paper pulp production process. Based on Volvo's experience, and experience of experts from other companies dealing with similar research, the European Union's supreme authorities estimate that by 2030, bio-DME (dimethyl ether, C_2H_6O) could replace as much as half of diesel fuel currently used for road freight transport!

And while engines that burn natural gas are offered by the majority of competitors, and many experiment with other alternative fuels, the Volvo truck division is a leader in development, and the bus division is a leader in the production of hybrid, diesel/electric vehicles. In 1995, on the streets of Gothenburg, the "hometown" of Volvo cars and commercial vehicles, the first prototypes of electrical and diesel trucks and buses saw the light of day, and they were original in terms of their shape, and even more unusual in terms of the engine. Over the next 12 years, the hybrid drive technology was so perfected that in 2007, Volvo could already offer trucks and buses manufactured in preproduction with a combined drive group - an electric and diesel engine.

The humble, rational and ecologically very conscious Swedes estimate that the development of hybrid propulsion trucks has not yet reached the level of large-scale application, and in the past ten years in Gothenburg they have diligently improved the hybrid "technique" built into trucks for distribution and communal activities - above all garbage collection and disposal. They continued to bring them onto the production lines at full speed, and at the same time they experimented with a hybrid drive on the heaviest, and in terms of the extent of production and sales the most widespread Volvo trucks for long-distance transport, specifically the FH family.

In May 2016, the first version of a concept truck was presented, and in late February 2017, the second further improved version was presented as well. In addition to improved aerodynamics, reduced rolling resistance and lower mass, the new version also had a hybrid drive - one of the first of its kind built into heavy "road cruisers" for long-distance, international transport.

Based on road trials, Volvo experts estimate that in long-haul transport, a hybrid drive could enable diesel and other internal combustion engines to shutdown up to 30% of the time while driving. This can save 5 to10 percent of the fuel, depending on the type or specification of the vehicle, mass, driving cycle and topography. Advanced solutions on the concept tractor provide the option of driving in a fully electric mode - up to 10 km, when there is practically no pollution, and the whole transport combination (towing + towing vehicle) emits a low noise level.

The hybrid technology built into the concept tractor allows recovery of electricity when driving downhill - on inclines greater than 1% or when braking. The resulting current is sent to the batteries and is used to drive the truck in a fully electric mode - on flat roads or roads with small inclines. The advanced version of the drive system predictable engagement - I-See, which has been developed by Volvo Trucks (and is already being built into the heaviest FH family), is additionally adapted to hybrid drive circuits, and by analyzing the topography of the upcoming terrain, it precisely determines the most economical and efficient engagement of diesel and electric engines, as well as optimum renewed energy exploitation time. Combined with other improvements in conventional versions, the most impressive effect of the still experimental hybrid technology for heavy trucks is a total reduction in fuel consumption and CO_2 emission by about 30 percent.

Also, these are great energy and ecological results already being achieved by other large-scale vehicles with a Volvo mark - city buses! With nearly 4,300 "electrified" buses sold from production in Europe and from the North American daughter company Nova Bus, Volvo Buses is the absolute world leader in this field! Volvo launched the first serially manufactured buses with a hybrid drive system in 2010. Year after year, the range of vehicles with alternative drive solutions has continually increased and sold, so today Volvo Buses offers comprehensive system solutions for public transport with a combined or fully electric drive - diesel-electric hybrid buses, electric hybrids and fully electric buses. Diesel-electric hybrids are available in a conventional 12-meter configuration, as articulated buses, and also as double-deckers.

And finally, at least partly, let's demystify one of the currently most promising alternative technologies for driving Volvo's public transport buses (and also Volvo trucks): the "green" buses in Čačak (as well as on the streets of numerous cities in 22 countries around the world) are driven by a parallel hybrid drive system developed and manufactured by Volvo. They are comprised of an Euro V four-cylinder diesel engine with a Volvo working volume of 4.76 liters with 215 hp and 800 Nm of maximum torque, and a 120 kW electric engine with the same maximum torque of 800 Nm. The rear wheel drive is carried out by the Volvo I-SAM system, which includes an automated I-Shift 12-gear trans-

Since early April, Volvo hybrid drive technology has been "ridding" in Serbia: Čačak is the first town in our country, in the Balkans, and also in the wider region where 10 Volvo buses with the most advanced technology are used for local passenger transport with a combined diesel-electric drive. In the first days of exploitation, they already confirmed the factory declared parameters: their consumption is lower by a third compared to the diesel engines, and the emission of harmful gases is smaller in similar proportions.

"On one of the busiest lines, the 18-kilometer long Sloboda-Slatina line, which transports between three and five thousand passengers per day, the Volvo 7705 LH Hybrid bus has demonstrated all the advantages of a hybrid drive compared to conventional diesel engine powered vehicles: our drivers have achieved an average fuel consumption of 29 liters per 100 km with them, while the consumption of buses of similar transport features with a conventional diesel engine is about 45 liters per 100 km", says Marko Živković, the main dispatcher of urban and suburban traffic in Autoprevoz-Čačak. "But for our residents, it is of greater importance that the emission of harmful exhaust gases is reduced in a similar proportion, i.e. by a third. Our hybrid "firstborns" produce far less noise, not just when starting off, but also during a continuous drive," adds Mr. Živković.

mission. The entire drive group is mounted on the line in the left rear part of the chassis (similar to conventional diesel-powered buses). The lithium-ion battery "pack" is mounted right behind the front left wheel. This drive group is equipped with a Stop-Start system, which, when the batteries are fully charged, turns off all the engines while the vehicle is idle, which further reduces the consumption and emission of exhaust gases.

The Volvo hybrid bus starts moving almost silently, given that the starting-off of the vehicle is powered by an electric engine running only on electricity. When the vehicle reaches a speed of 15 to 20 km/h, it turns on and also occasionally turns off a conventional diesel engine, which has the role to recharge lithium-ion batteries that accumulate electricity to drive the electric engine. Electricity is accumulating every time a driver of a Volvo hybrid bus hits the brakes. That is where, among other above "places", all the Volvo hybrid "magic" lies.. ■

ARE VEHICLES GREENER ON THE OTHER SIDE AS WELL

With Matt McGrath, BBC journalist specialized in reporting on science and ecology, we discussed the steps that are being taken in the United Kingdom to alleviate the apparent climatic changes caused by the increased concentration of carbon dioxide

Ever since the European Commission warned the government of the United Kingdom about the poor quality of air in 16 mainly city areas, threatening with the legal proceedings to be pursued before the Court of Justice if the British authorities do not take urgent measures such as reducing the volume of traffic, switching to electric vehicles and reducing the emissions of gas emission from diesel vehicles, there has been a lot of controversy in the British media about the major effects of the immediate measures. The London Mayor Sadiq Khan announced the impending implementation of one of the strictest standards for the emission of harmful gases, and that also involves a new levy that the owners of diesel and petrol vehicles produced before 2005 and not complied with the Euro 4 standard, would have to pay for driving through the central part of London. Opponents of the announced measures are largely arguing that the air in the city won't become cleaner and the desired outcome won't be attained, due to the fact that of all the vehicles passing through the main streets of this metropolis merely 7% belong to a group affected by this additional charge.

EP What problems have the authorities been facing in the attempt to reduce pollution in urban areas, most importantly in London, where high concentrations of nitrogen oxide were measured?

Matt McGrath The issue in the UK particularly has become acute because of the incentives the government gave to car purchaser back in the mid 90's to buy diesel cars and now about the half of the cars in UK are diesel. It is not only about the private drivers - there are vans, taxis and all those heavy goods vehicles... So, most of the local governments are trying to tackle the issue by looking the other way, not by tackling it. It is only because of the court cases

We'll be eyewitnesses of massive changes over the next 10 years and one of them could be **the launching of electric cars driven by a program, instead of a driver**

Photos: (small photo) Matt McGrath, a BBC journalist • Tamara Zjačić

that made them do something about the pollution problem. London is global city with millions of people who live and work there, and the majority of the government officials are aware of the possible growth in number of lawsuits. The new mayor is undoubtedly trying to solve the problem, so he has introduced the measures which created a huge low emission zone in the city, and the aforementioned additional levy for older vehicles coming into the central zone will be introduced during this year. There's no doubt it will hugely contribute to the pollution reduction. As far as other communities, or the rest of the UK, it is more difficult to introduce the changes. So for example, last year central government informed the local authorities they have three million pounds to tackle the air pollution problem which should be distributed among all the local governments, but London alone spent 180 million pounds. So, the government doesn't want to deal with this in a comprehensive way, local governments have the responsibility but lack resources, so at the moment the problem falls between the two. Right now, there is a needle gun being held at the government's head and they will have to do something about it and what they will do nobody knows.

EP One way to reduce the emissions of harmful gases is also to increase the number of electric vehicles. What kind of incentives does your government give for purchase of these vehicles?

Matt McGrath The buyer gets the grant of about 5,000 pounds. One must know that most of our motorways are electrified so drivers of electric car can travel around

As for the pollution problem in urban environments, there is a needle gun being held at the British government's head. It is clear **they will have to do something about it but what they will do nobody knows**

the country and find charging station every 20 miles. No wonder the sales of electric cars are going up. Although it has gone nearly well, it still can't measure up to the market in Norway, which is the world leader in this field. Recently, I have heard an interesting story from my colleague who bought a petrol car and surprisingly enough, he waited for its delivery. Not so long ago, diesel car was usually sold as a family car, and generally you would have to wait for its delivery, and nowadays you have to wait for petrol car the whole six weeks. There is a change taking place in the mentality, people are moving away from diesels back to petrol, or back to hybrids, whose sales have gone pretty well. I really think we are witnessing the change in people's minds. Nowadays, people think more about the pollution and they are more concerned about it because their children ride in family cars that go on diesel, or go to school by buses which also use diesel, so in that way they are exposed to harmful gases more often than not. I think all of this has led to a breakthrough and the idea of buying hybrid or electric

Photo: Matt McGrath

WHO IS MATT MCGRATH?

Originally from Tipperary in Ireland, this distinguished journalist is the author of numerous features and articles on major problems in environmental protection. Matt had edited computer magazines before he joined BBC in 1994. While working for British Broadcasting Corporation he reported on particularly sensitive issues in science and environment such as cloning, global warming, doping in sports, GM food and foot and mouth disease. However, he caught great media attention with his reporting from the solar eclipse in Alderney in 1999 and the coverage of his travelling to the Arctic in 2007. Matt also made an impressive reportage during the UN summit in Copenhagen in 2009 when he jumped into the icy water from the city harbor.

vehicle is even more acceptable. Having taken into account all the facts, the United Kingdom is today cleaner than it was 20 years ago. The air is also cleaner.

EP How much does the UK use renewable energy sources?

Matt McGrath Last year we got 20% of electricity from renewable sources, out of which solar energy made the largest share. We also got 20% from nuclear power plants and all other sources provided the rest of energy we needed. Due to its position, our country can use the power of the wind, both on offshore and onshore wind farms. When it comes to biomass, there is no shortage of this resource in our country, but its use raises a lot of questions since it is produced by cutting and burning trees.

EP What needs to be done in one country in order to have more electric cars on roads?

Matt McGrath It takes a more integrative approach and strategy if you want to have more electric cars. It is necessary to develop the electric car market, but the situation in this field depends also on other things, so we have to wait for certain changes to happen: batteries need to be better; Tesla has to make a new, cheaper vehicle. Skoda made an announcement at the beginning of this year that by 2020 they would have all hybrid cars, and that is very good news. I'm sure we'll be eyewitnesses of a massive change over the next 10 years. There will also be self-driving cars, which means that the program, instead of driver, will be responsible for driving.

EP Lastly, do you find realistic the expectation for the Republic Ireland to stop using fossil fuels for electric energy production by 2030, as it has been announced?

Matt McGrath The Republic of Ireland is in a position to have more energy than it can use, either from wind, coal or some other source. As for climate and eventual changes which would be caused by shifting to renewable energy sources, the big issue is that Ireland is an agricultural country, and animals, especially cows, could be in danger if they build power plants which use wind, water and other sources. It is possible to get to that point, since they have various ways for electricity production, but I don't think Ireland will be the top of the class when it comes to the giving up the use of fossil fuels by given deadline. Even if they reach the goal, it would be just a portion of the picture.

Interview by: Tamara Zjačić

There is a change taking place in our mentality, and **people are moving away from diesels** back to petrol and hybrids, or they are opting for electric cars

Photos: Tamara Zjačić

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ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

Terra 53 multi-standard DC charging station

The Terra 53 multi-standard DC charging station is a configurable single, dual or triple outlet 50 kW fast charging station. Its flexible multi-protocol design supports CCS, CHAdeMO and AC functionality depending on the individual charging needs of each customer. The Terra 53 is ideal for use at highway rest stops, petrol stations, car dealerships and busy urban areas.

The Terra 53 combines industry standardization with fast charging technology to support all current and next generation vehicles. Its multi-protocol design allows for easy tailoring to support CCS and CHAdeMO 1.0, as well as the EN61851-1 standard for AC charging (Type 2, Mode 3).

All ABB chargers come with Internet based Connected services to allow customers to easily connect their chargers to different software systems like back-offices, payment platforms or smart grid energy systems. This allows for remote assistance, tailored diagnostic trouble shooting and repair, and remote updates and upgrades. A reliable, secure, cost efficient and future proof connectivity solution, based on open industry interfaces.

MAIN FEATURES

- 50 kW DC fast charger supporting CCS and optionally CHAdeMO
- Optional 43 kW AC cable or 22 kW AC socket
- Designed to deliver full output power continuously
- IEC 61000 EMC certified for industrial and residential areas (including petrol stations, retail outlets, offices, etc.)
- Future proof connection via open industry standards:
  - Flexible interfacing with added value systems
  - Remote uptime monitoring and assistance
  - Remote updates and upgrades
- Daylight readable touch screen display
- Graphic visualization of charging progress
- RFID authorization
- Robust all weather stainless steel enclosure
- Quick and easy installation
- Low operational noise

APPLICATIONS

- Highway petrol/service station operators
- Busy urban areas
- Commercial fleet operators
- EV Infrastructure operators and service providers
- EV dealers and importers

KEY OPTIONAL FEATURES

- Payment terminal
- Pin code authorization
- Input power limiting software to avoid expensive grid upgrades
- Web modules for statistics and access management
- Integration with back-offices, payment platforms and smart grid energy systems
- Wider temperature range: -35°C to +55°C
- Customized branding possibilities

POSSIBLE CONFIGURATIONS

Terra 53 is available in the following configurations:

- Terra 53 C: CCS
- Terra 53 CT: CCS and 22kW AC socket
- Terra 53 CJ: CCS and CHAdeMO
- Terra 53 CG: CCS and 43 kW AC connector
- Terra 53 CJT: CCS, CHAdeMO and 22 kW AC socket
- Terra 53 CJG: CCS, CHAdeMO and 43 kW AC connector

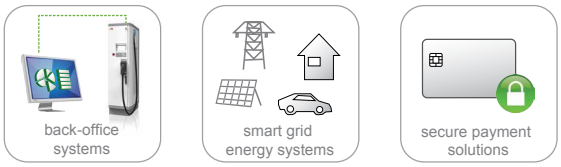
Outlet specifications	C (default)	J (option)	G (option)	T (option)
Charging standard	CCS	CHAdeMO	Type 2 cable	Type 2 socket
Maximum output power	50 kW	50 kW	43 kW	22 kW
Output voltage range	50 - 500 V_{DC}	50 - 500 V_{DC}	400 V +/- 10%	400 V +/- 10%
Maximum output current	125 A_{DC}	125 A_{DC}	63 A	32 A
Connection standard	EN61851-23 / DIN 70121	CHAdeMO 1.0	EN61851-1	EN61851-1
Connector/socket type	Combo-2	CHAdeMO / JEVS G105	IEC62196 Mode-3 Type-2	IEC62196 Mode-3 Type 2
Cable length	3,9 m	3,9 m	3,9 m	-
Compatible car brands	BMW, Volkswagen, GM, Porsche, Audi	Nissan, Mitsubishi, Peugeot, Citroen, Kia	Renault, Daimler, Tesla, Smart, Mercedes	Renault, Daimler, Tesla, Smart, Mercedes, Volvo, Opel

Possible configurations (from left to right): Terra 53 C, Terra 53 CT, Terra 53 CJ, Terra 53 CJT, Terra 53 CJG with optional payment terminal (not shown, amongst other, Terra 53 CG and Terra 53 Z)

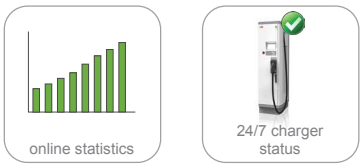
General specifications	
Environment	Indoor / outdoor
Operating temperature	-10 °C to +55 °C (de-rating characteristic applies) Option: -35 °C to +55 °C
Storage temperature	-40 °C to +70 °C
Compliance and safety	CE, RMC, EAC, J versions: CHAdeMO 1.0
EMC emission EMC immunity	IEC 61000-6-3 Class B - Residential IEC 61000-6-2 Industrial
Input AC power connection	3P + N + PE
Input voltage range	400 V_{AC} +/-10% (50 Hz or 60 Hz)
Max. rated input current & power	C, CJ: 80 A, 55 kVA CT, CJT: 112 A, 77 kVA CJG, CG: 143 A, 98 kVA Power limiting options available
Power factor (full load)	> 0.96
Efficiency	94% at nominal output power
RFID system	ISO/IEC14443A/B, ISO/IEC15693, FeliCa™ 1, NFC reader mode, Mifare, Calypso, (option: Legic)
Network connection	GSM / 3G modem, 10/100 Base-T Ethernet
Protection	IP54
Dimensions (D x W x H)	780 mm × 565 mm × 1900 mm
Mass	350 kg

Advantages of connected charging

Flexible interfacing with customer's added value systems



Optimal insight in charger operation



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Optimize user experience

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2 MILLION ELECTRIC CARS NOW TROLLING POLLUTION

Photo: Wikimedia/Marco Verch
https://commons.wikimedia.org/w/index.php?curid=46351214

The number of electric cars in the world has increased 60% since this time a year ago, according to the International Energy Agency. That's the good news. The not so good news is that electric cars still only account for 0.2% of all the cars in the world. The rest are conventional vehicles that flit along the highways and byways of the world, spewing who knows what out of their tail pipes.

Let's get back to the good news. Sales of electric cars are accelerating and anyone who understands exponential growth can see that it won't be long before the total number of electric cars in the world begins to shift from negligible to significant.

The latest IEA report says, "China was by far the largest electric car market, accounting for more than 40 percent of the electric cars sold in the world and more than double the amount sold in the United States. It is undeniable that the current electric car market uptake is largely influenced by the policy environment."

The number of electric cars available to consumers is also experiencing dramatic growth. Automakers from Mercedes, to Volkswagen, to Hyundai are working furiously to bring more cars with plugs to market. Emissions regulations are spurring growth as well.

Just a few years ago, car companies thought they could meet tough new emissions rules in Europe with clean diesel technology. That idea exploded in the wake of the diesel emissions scandal that washed over Volkswagen in September of 2015.

Since then, prosecutors in Germany, France, and South Korea have begun investigating diesel cheating by other manufacturers, including Mercedes-Benz. It is now apparent that only adding electric motors will allow cars intended for sale in Europe to meet those emissions standards.

Tesla also deserves tremendous credit for making electric cars cool. It has at least 500,000 reservations worldwide for its Model 3 midsize sedan. Countries like India are toying with laws prohibiting the sale of cars with internal combustion engines as early as 2030.

The electric car revolution is gathering speed. It's time to get on board or get left behind.

Adapted by: Sandra Jovićević

THE REVOLUTIONARY ELECTRIC CAR BATTERY THAT CAN BE FULLY RECHARGED IN JUST FIVE MINUTES

Photo: Store Dot;
https://www.store-dot.com/business-units

Israeli nanotech firm StoreDot has unveiled a radical 'ultra-fast-charge' battery it claims can bring an electric car to full charge in just five minutes – and power it for up to 300 miles.

At the CUBE Tech Fair in Berlin, StoreDot demonstrated a proof of concept of the technology it says is a 'radical improvement over the traditional lithium ion battery structure.'

The FlashBattery combines organic compounds with nano-materials to slash charging time down to a fraction of that achieved by current methods, and the firm says it will be available in the next three years.

According to a video on the technology, a car running on StoreDot's modules would be equipped with forty 'pouches' – each containing the FlashBattery technology.

These pouches contain nano-dots made from short chains of amino acids, called peptides, arranged in a layered structure.

The peptides are chemically synthesized organic molecules of non-biological origin, according to StoreDot. When combined, these pouches make up a charging module.

'The FlashBattery Technology allows for unprecedented charging rate', company says.

'Within five minutes of charging, the car is fully charged and ready to go – five minutes that just bought you an average of 300 miles.'

Adapted by: Marija Nešović

BY 2020 A THOUSAND ELECTRIC CHARGING STATIONS WILL BE ON SERBIAN ROADS

At the public discussion on the strategy of charging stations installation for electric vehicles in Serbia, held this spring at the Building Trade Fair, it was stated the strategy should be planned and executed by Serbian Chamber of Commerce and Industry, using good European experiences.

Since Serbia is a transit country, by 2020, about a thousand charging stations for various vehicles types should be installed in the cities and on the road corridors, as estimated by the experts. The action holders may be local self-Governments and individuals and the licenses for the charging station installation will be simplified, since Ministry of Infrastructure wants to mass the transit traffic – the interested companies and individuals will be able to request them through the Internet.

Photo-illustration: Pixabay

–Ministry manages all road directions and it is interested in the installation of as many charging stations as possible on specific points at the Corridors 10 and 11 – said Aleksandra Damjanović, State Secretary in the Ministry of Transport and Infrastructure.

From the Faculty of Electrical Engineering it was stated the existing electric power network is not ready for high loading, but Serbia was rich with renewable energy sources, which could also charge cars.

– Solar panels with direct current and batteries gave excellent results in the rural parts of Serbia and in Belgrade, pointed out Nikola Rajaković from the Faculty of Electrical Engineering in Belgrade.

The electric vehicle sellers said they were ready to invest money into the network, but the development strategy was necessary, since it was a complex project. Aleksandra Đurđević from Delta Auto – BMW said Croatia already had a thousand public charging stations for the cars, it was necessary to start that process also in Serbia and she hoped it would happen soon.

IEEG Institute in Stara Pazova will be the first local manufacturer of the charging stations.

Adapted by: Marija Nešović

AUSTRALIA PLANS TO SET THE RECORD FOR ELECTRIC VEHICLE HIGHWAYS

Foto-ilustracija: Pixabay

Electrical vehicles are the next evolution in personal transportation. A large-scale shift toward the technology has the potential to significantly reduce the environmental impact of simply getting around, leaving our reliance on gas powered vehicles behind.

However, given that the technology is in its relative infancy, the lack of established infrastructure to support a major shift to EVs remains a significant roadblock to adoption. EVs are limited by their range, and while developing the technology continues to lengthen the range, many models are best suited for shorter trips.

In order to combat the range obstacle and begin establishing the infrastructure necessary for supporting an expansion of EV usage, Australia is setting up "EV highways," equipped with numerous fast-charging stations along the way.

The project, dubbed the Electric Super Highway, is planned to be a series of charging stations located in 18 cities and towns, spreading across nearly 2,000 kilometers (1,242 miles) of the road from the Gold Coast in the south to Cairns in the north. And, according to the (aptly named) state's acting roads minister, Steven Miles, "They will be available for use at no cost for the initial phase of the super highway so we can encourage as many people as possible to start using them."

The government claims that this sets a new record for length of electric highway in one state.

Adapted by: Marija Nešović

SUPERVOLCANO MINERALS DISCOVERY TO BOOST GREEN CARS

Photo: Wikimedia/Mario.do https://commons.wikimedia.org/w/index.php?curid=23772761

Photo-illustration: Pixabay

Scientists have found an unexpected new source for lithium, a key component in battery-powered electric cars and other renewable energy technologies: supervolcanoes.

Most of the world's lithium comes from Chile and Australia, and expanding access to the mineral is crucial for meeting demand for new green technologies to reduce carbon emissions, Stanford University scientists said on Wednesday, reports Thomson Reuters Foundation.

"The demand for lithium has outpaced the scientific understanding of the resource, so it's essential for the fundamental science behind these resources to catch up," Stanford University researcher Thomas Benson, the study's lead author, said in a statement. "Now we have a way to easily find more of these lithium deposits."

The discovery comes as more companies, including large carmakers whose products cause significant carbon emissions, work to develop climate-friendly technologies. Electric cars, which use lithium ion batteries, are gaining traction as an emission-free alternative to conventional cars.

"We're going to have to use electric vehicles and large storage batteries to decrease our carbon footprint," Gail Mahood, a professor of geological sciences at Stanford University and the study's co-author, said.

Supervolcanoes are much larger than ordinary volcanoes and erupt at least 1,000 cubic kilometers of material in one eruption. Scientists studied the contents of craters left by supervolcanoes in Oregon, Nevada and other parts of the United States, which erupted millions of years ago.

They sliced through tiny bits of volcanic magma, which were trapped in crystals in the craters, and analyzed them to find the valuable silvery-white metal. Sweden-based Volvo pledged last month that all new cars it launches after 2019 will be electric vehicles or hybrids.

Other automobile firms are also planning to increase production of electric vehicles, which will boost the demand for lithium, considered a strategic resources by some governments.

Adapted by: Vera Rakić

TESLA MODEL Y SUV ARRIVES SOON

Now that the Model 3 has officially hit the roads, we are looking forward to the next car that Tesla is working on. The Model Y is Tesla's new compact SUV, and completes the running joke in Elon Musk's naming scheme, with the Model S, Model X and the recent Model 3.

Photo: Tesla Motors

The Model Y will be the first compact SUV offering from the electric car manufacturer. It makes sense as a move for Tesla, considering the success of other compact SUV's like the Toyota RAV4 and Ford Escape in the US market. Musk is obviously aware of the value of the compact SUV market, referring to it at the "biggest product segment in the world".

According to a tweet from Musk, the Model Y is going to be built off the Model 3 chassis. This is interesting as Tesla already has an SUV (the Model X), so the fact that it's being built off the chassis of the 3 potentially means it is aiming for a similar customer base.

Originally Musk had claimed that the Model Y was going to be manufactured in a way entirely independent of the Model 3, and was due for a 2019 / 2020 release.

However, at a recent earnings report, Musk changed his stance on this and has said that certain elements would share manufacturing origins:

"The Model Y will be using substantial carryover from Model 3, which means it will come to market much faster." While we don't know exactly what 'much faster' will mean, we're quietly hopeful that we'll be seeing the Model Y by the end of 2018.

Priredila: Vera Rakić

E PRIME BICYCLE

To the finish line in a healthy way!

Electric bike, produced in our country by E prime, is an ideal means of transport for holidays or city traffic. This modern means of transport that is available to all generations, reaches the ideal speed and offers an environmentally friendly solution for you.

We can increasingly see electric bikes in the streets that you do not need to register, don't have to get driver's license and the range of up to 200 km on a single charge hints that this bicycles could replace cars that are big polluters of our living space.

From year to year electric bikes become more and more popular and unique design of E prime models will satisfy the most demanding customer needs.

Domestic producer made sure bringing to the market both, a male and a female model that runs by a fingerprint. In addition to visually good-looking bike, this mode of transport saves a lot of money.

Why spend money on fuel when you have a fully ecological means of transport on the battery? Without stress and with a lot of enjoyment electric bike gives you a safe and economical driving.

E prime salon is opened at 1 Milutin Milanković street in New Belgrade and test drive can be arranged by calling the number: 011 43 20 100.

There are several models in the E prime offer that you can buy on an interest-free loan of 55 EUR per month with a repayment period of 2 years.

Call them to schedule your test drive and then choose the model that suits you to reach the goal in the healthy way. ■

All photos: "E prime"

Jovana Mehandžić Đurđić

Free Charging of Electric Cars at IKEA

We have all heard of the Swedish giant IKEA – the world's leading retail chain with a wide range of products for home decoration. The main concept of IKEA involves developing of products that are characterized by good design, functionality, quality, and sustainability at such affordable prices that a huge number of people can afford them.

This is also the company to which the sustainable development is one of the important aspects of running business, and therefore has developed the IKEA Group Sustainability Strategy for making change "People and Planet Positive". In addition to this Strategy, IKEA has been applying the IWAY standard for years, which represents the company's code of conduct in many areas such as working conditions, prevention of child labor and environmental conditions.

The department stores in Zagreb and Belgrade **offer free charging of electric vehicles** to our customers

Following innovations in all fields, IKEA has installed two chargers for electric cars in its first department store in Serbia, whose opening we are eagerly waiting for. While we are waiting for IKEA to open their doors to numerous buyers, we have used an opportunity to talk to Jovana Mehandžić Đurđić, Regional Manager for Sustainability of the company IKEA for Southeast Europe, about the chargers, renewable energy sources that IKEA uses, company's sustainability principles but also about their plans for further development.

All photos: IKEA

EP IKEA is the first department store in our country that installed chargers for electric vehicles. Do you believe that there will be enough drivers of electric cars and therefore greater need for chargers?

Jovana Mehandžić Đurđić Sustainability is one of the key development principles of IKEA and we strive to have a positive impact on people and the planet. When we talk about chargers for electric vehicles, it means that we encourage and motivate our customers to come to IKEA department store by means of transport that is sustainable or at least more sustainable than the traditional ones. In the Great Britain, for example, in the last five years, IKEA has partnered with "Ecotricity" and together they offer free charging for electric cars. We believe that such a strategic approach has contributed to the increased use of electric cars in the Great

We encourage and motivate our customers to **come to IKEA department store by means of transport that is sustainable** or at least more sustainable than the traditional ones

Britain and thus reduction of greenhouse gases. Guided by this kind of examples, we believe that charging network and the increase of electric vehicles in Southeast Europe and thus in Serbia is yet to come. Health and the environment are important factors for the life quality of our customers so IKEA offers them a possibility to behave, as the company itself, more responsible to the world in which they live and in accordance with the principles of sustainable development. There will be a public transport line to the department store IKEA Belgrade East, so our customers will not have to use only their vehicles to come to our store.

EP Can you tell us more about your chargers? How much does an hour of charging cost?

Jovana Mehandžić Đurđić People will be able to charge their electric vehicles on two parking lots. Since the region of Southeast Europe is relatively young market for the company IKEA, the department stores in Zagreb and Belgrade offer free charging of electric vehicles to our customers. We want to encourage people to turn to alternative energy sources to greater extent, and this is just one of the activities in that direction. Globally, IKEA is considering installation of super-fast chargers, as well as Tesla's chargers into each IKEA facility.

Schneider Electric's 22kW AC fast charger is installed in our department store in Belgrade. We believe that this is just the beginning, as the need grows, IKEA will adjust its capacities. Thus, for example, IKEA department store in Zagreb offers charging of electric cars on eight parking lots

IKEA is part of "Better Cotton Initiative" which means that the wood they use in production is certified and the origin is known. The goal is that by 2020, 100 % of wood they use, as well as paper and cardboard, comes from more sustainable and responsible source of energy. Today, IKEA is one of the biggest users of wood purchased in retail and with FSC certification (a guarantee that the wood comes to the end user by a strictly tracked chain – from wood through processing to production). IKEA also takes particular care about reducing water consumption during the production process (e.g. during the production of cotton and textile dyeing) as well as in operational business. By 2020, IKEA has set to produce as much energy as they produce, and apparently, they are on the right way to achieve that, but not only through solar power plants on the roof but also by obtaining energy from wind parks that IKEA owns around the world. Also, they introduce numerous innovations in the field of circular economy, which involves converting waste into resources as well as prolonging the life of products.

through four fast chargers of 22 kW AC, Etrel brand from Slovenia.

EP What is IKEA's expansion plan in the region and will you install chargers in all new department stores?

Jovana Mehandžić Đurđić IKEA has an ambitious expansion plan in the region of Southeast Europe – it can easily be said that we are at the very beginning of growth in the four countries which that region includes (Slovenia, Croatia, Serbia, and Romania). Department store in Belgrade is 400th globally, and by 2025 we will open 13 more department stores in Slovenia, Croatia, Serbia, and Romania. We will continue to install chargers in each of our new department store that we build. We hope that by building this infrastructure we will draw attention to legislators to make this technology available to higher number of people.

EP IKEA is trying to be energy efficient and responsible to nature in every sense, so you have installed solar panels on the roof of your department store.

Jovana Mehandžić Đurđić IKEA follows the values and the concept of its founder Ingvar Kamprad who grew up in Smaland, Sweden. Rocky landscape is dominant in Smaland, so its inhabitants have a reputation of being inventive since they use all raw materials in a thoughtful way and they do not recognize imperfect solutions. That spirit that also reflects the firm belief that no method is more efficient than a good example is incorporated into IKEA.

In that sense, department store IKEA Belgrade East will use its own photovoltaic plant, that is solar panels of total installed power of 340 kWp, and on their installation, we cooperated with the company Strabag as well as domestic company MT-Komex. The efficiency of the panels is 15.4 per cent and we believe that the use of solar energy will bring us sufficient savings in daily operation.

EP Will the part of the produced energy for chargers come from RES? Will you sell the surplus of the produced energy or it is just for your own needs?

When it comes to sustainability, each new department store that they build is characterized by state-of-art technological solutions, which is why their department store is among the most sustainable facilities in the region. The following innovations are applied in IKEA department stores in Belgrade and Zagreb:

- **Separation and management system for 23 waste fractions that reduce the amount of municipal waste to less than 10 per cent,**
- **Geothermal pumps for cooling and heating,**
- **The use of rainwater for flushing toilets,**
- **A modern building management system that optimizes resource consumption,**
- **Plant for purification of wastewater,**
- **Solar panels on the roof and use of only LED lightning in the facilities that will significantly reduce the amount of electricity that we will need for everyday functioning.**

Jovana Mehandžić Đurđić Generally speaking, solar power plant will supply part of our electricity consumption which is between 10 and 20 percent, depending on the season and the amount of solar energy. Chargers are definitely part of that system.

The tender procedure, on our side, is still in process, so the answer to this question will soon be known.

EP Does IKEA have eco vehicles in its fleet, such as electrical or hybrid?

Jovana Mehandžić Đurđić Internal policy and IKEA's commitment is to use less and less traditional fuel. We support the use of advanced biofuels, since this resource is obtained from waste and in the next phase we will turn to electricity obtained from green renewable energy source. IKEA actively promotes and encourages its employees and buyers to use more sustainable forms of transport and at the global level, we cooperate with our chain of suppliers and partners from industry in order to work together on innovations, ideas, and testing of the solutions in the field of transport and reduction of carbon footprint.

Prepared by: Nevena Đukić

We support the use of advanced biofuels, since this resource is obtained from waste and in the next phase **we will turn to electricity obtained from green renewable energy source**

Željko Milković

First Steps towards Electromobility of Public Transport in Serbia

Five electric buses represent heralds of progress that will significantly contribute to the reduction of harmful gas emissions in the future. One should not forget that the road leading to the realization of any significant project starts with a good idea and adequate support – says Željko Milković, General Manager of Public Utility Company City Public Transport "Belgrade".

When Belgrade received the first line of city transport with five electric buses last September, we could read in the news that Serbia became the first country in Europe with such a city line. Although the introduction of electric buses is a very important move that deserves media attention, our interlocutor Željko Milković, explained to us that electric buses have been running through European cities for some time already, but with batteries.

EP It is true that we are unique in the fact that electric buses with capacitors were put into operation on a city line for the first time. Why did you decide to get them?

Željko Milković The concept of the operation of our electric buses is significantly different from the one with batteries. We chose capacitor's drive because the differences are obvious: the battery requires more time for charging than the capacitor and its weight for a standard 12 m bus is 2.5 to 3.5 tons, while the capacitor weighs 90 kg. This actually means, that our bus has a bigger capacity for 15 passengers. In addition, batteries must be changed every four years, and although we do not know what the lifespan of the capacitor is, we are still covered with a 10-year warranty. When you consider the service life of a bus that ranges from 12 to 14 years, we are probably not going to change capacitors, while batteries would have to be replaced three times for the same period of time. The battery costs 15,000 to 20,000 euros, so the additional cost would be 60,000 euros per bus. Capacitors originated from military technology and the Russians first started using them because of many advantages. Over the past ten months, we have been convinced that electric buses with capacitors are reliable in traffic.

EP Why, then, other cities have electric buses with batteries?

Željko Milković It takes seven hours for charging batteries. We cannot provide this because the vehicles work 22 hours, so we have only 2 hours for charging. Furthermore, we would have to install plug-in chargers in the garages, which would mean that we need to eliminate one shift and reduce the traffic. Imagine a hundred buses, a hundred charging points, a hundred plug-in sockets. But even that is not disputable, in comparison with the fact how difficult it would be to carry out the power supply of the bus. Imagine turning on 100 chargers at the same time. This requires a hydro power plant, a system that can support such charging needs, then two substations, and each costs two million

All photos: City Public Transport

euros. And all this just to power 100 buses. Therefore, the battery-powered system can be introduced only in cities with fewer buses.

EP The decision of introduction of electromobility in public city transport was obviously a good one. Nevertheless, not every innovative idea gets support. How did you succeed in this?

Željko Milković The Secretariat for Environmental Protection and current Minister of Ecology Goran Trivan were our main support. They financed the procurement of buses and equipment and the Mayor Siniša Mali also liked the idea. It took 13 months to complete the project. From the company Chariot, which imports and distributes the buses of the Chinese manufacturer Higer, in Europe, we bought vehicles with capacitors of the Chinese company Aowei.

EP Are you satisfied with the charging speed of capacitors and the length of the road that a bus can cover from one place to another with a charger?

Željko Milković The length of road that a bus can cover with charging that lasts five to eight minutes, depending on the consumption and the amount of traffic, is 22 km. Currently, for a line that is 8.7 km long, the reserve of 35 to 38 percent of capacity remains, considering all possible unforeseen circumstances in traffic. This capacity is quite sufficient, although Aowei, a capacitor manufacturer, has already increased its capacity and now has a range of 36 km. Buses with these new capacitors, which are charged in about 2 minutes, are being tested in Graz.

EP What was the main goal you strived for, when you came up with the ideaof introducing this type of transport in Belgrade?

Željko Milković Our goal was to take the first step and introduce electric buses into the city traffic in Belgrade. Every start is difficult, but the benefit of this move is multiple. With a larger number of electric buses, we will reduce the emissions of harmful gases, we will contribute to the protection of the environment in the city, and the savings in energy consumption is also significant, because only one bus per day consumes diesel fuel in the amount of 100 eu-

THE CHINESE GO A STEP FURTHER

Aowei has introduced a novelty in the way of charging buses and it is currently being tested in the factory. By using this new technology, the bus, or the roof pantograph, should be charged while driving with a 1 km long slider and to which each vehicle is hooked, so it is charged and driven at the same time and then it goes off the slider and continues with driving. This has upgraded the existing charging system, which resulted in the fact that not even former 5 minutes are lost for charging buses. It is just a matter of time when we will see this on the streets of a metropolis.

A bus daily consumes diesel fuel in the amount of **100 euros**, and **electric bus consumes** electricity in the amount **of 20 to 25 euros**

THE STRUCTURE OF BUSES

Public Utility Company City Public Transport "Belgrade" has the inventory of 800 buses and about 620 are in traffic. They are mostly diesel buses, and in the coming period it is planned to install Euro 5 and 6 engines in vehicles, to replace older models, which would reduce fuel consumption and air pollution in the city. The management of this utility company is planning to purchase more electric buses to replace diesel buses. It is estimated that at least 100 more buses are needed, to notice the improvement of the public transport functioning.

ros, while the electric bus consumes electricity in the value of 20 to 25 euros. So, when you multiply these amounts with the number of buses and years of exploitation, the calculation is clear. Electric bus pays off in the sixth year and from 6th to 12th year we have a pure profit. Therefore, at first, the investment is bigger, because the electric bus is three-times more expensive than the diesel one, but in the long run, the electric bus is a better choice. Likewise, we have the ability to acquire practical knowledge of how this advanced technology is used. Apart from our engineers, future experts who are studying at our universities today and who do not have enough experience with new technologies, have the opportunity to improve their knowledge. I want to invite professors from the Faculty of Electrical Engineering to bring their students to the workshops we organize and to interest them in this topic.

EP Do you plan to purchase more electric buses and on which lines would they operate?

Željko Milković Considering the positive experience, we will surely get more electric buses. Four out of the five buses are in traffic, and we use the fifth for testing. We monitor the consumption and all other parameters and when we get everything done, we will present the project to the Mayor. The idea is to slowly replace trolleybuses with electric buses, although it is considered to have the biggest benefit when a diesel bus is replaced with the electric one. Although a trolleybus is excellent, it has its limitations: getting around depends on the grid which has high maintenance costs, and the grid itself spoils the appearance of the city. The electric bus is independent of the grid and is certainly cheaper when it comes to costs. So far, we are performing tests on trolleybus lines 29 and 41 and we plan to introduce more of these vehicles on other bus lines. Chargers are set up quickly and the project for trolleybus lines is ready. The only problem is power supply and we expect "Electric Power Industry of Serbia" to support us and enable us to connect to the electricity grid, because with a growing number of electric buses and chargers there is a need for substations.

We took two types of chargers to test them. The charger in Belville is charged from the grid with 380 V voltage, and the charger at Vuk station is powered by a 650 V voltage from the tram network. In this network we have large peaks, so in comparison with standard 600 V voltage, the peaks can reach from 1200 to 1500 V. It is difficult to protect devices in peak currents, fuses and switches are needed and turned on. The complete tram network has 21 old substations, the oldest ones are from 1936. Investments in new mobile substations of container type are necessary and the price of one is about two million euros. To conclude, the acquisition of electric buses is not a problem, because Higer, a Chinese manufacturer of electric cars, produces 70 pieces a day. We need a system solution for power supply.

EP In your opinion, what would be the measure that could have the greatest effect in Belgrade in the field of environmental protection when it comes to vehicles and driving in the city?

Željko Milković Since all public and private transport in Belgrade takes place through narrow streets of the city with congested traffic, especially in the rush hour, it is necessary to complete the construction of the internal main ring, as well as to start building the metro. It is also necessary to limit the entry of passenger cars in the city centre, but only when we have a good alternative to public transport, such as the metro. Until that happens, we have already taken steps and I am sure that by introducing electric buses we have set up a sound basis. Now, further development is possible.

Interview by: Tamara Zjačić

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PROJECT "Sustainable Energy For South East Europe"

There is a justifiable fear that South East Europe will lose its pace with the rest of the continent if it does not adopt a long-lasting and far-reaching strategy of investing in a sustainable, efficient, renewable energy system - because in the next 10 years, almost 90 per cent of the energy infrastructure using lignite (brown coal) is expected to close these plants or begin their reconstruction.

It is necessary to make a decision on how to replace the existing capacities of brown coal as soon as possible. Considering the construction period of new plants is 5 to 8 years and their life expectancy 40 to 50 years, investments in energy must be managed with clear long-term goals.

In support for the creation of a long-term vision for the regional development, a group of organizations from Albania, Bosnia and Herzegovina, Montenegro, Croatia, Macedonia, and Serbia, gathered around the project "Sustainable Energy for SEE", developed the Energy Model 2050 for South East Europe, based on Calculator 2050 - a tool developed by the United Kingdom Department of Energy and Climate Change (UK DECC), successfully used by many countries*. Thanks to the participation of the Belgrade non-governmental organization "Fractal" in this project, this energy model is available and makes exploring a wide range of energy and emission scenarios easier for us, and it can be used by technical experts and decision makers, as well as interested public. This tool provides the opportunity for citizens to create an opinion and attitude about their energy future.

With this model, partner organizations selected and compared two scenarios for the region. The first one follows the worst route regarding climate impact and implies continuous dependence on fossil fuels, with the focus on new coal power plants, without ambitious targets for increasing energy efficiency, instead of new renewable energy sources. In contrast, the low carbon scenario shows how the region can reduce energy losses and move to a sustainable, efficient and renewable system, allowing countries to meet the goal of reducing harmful emissions by 80 per cent by 2050 compared to 1990. In this scenario, the transformation of the transport sector and especially the transport electrification represent an essential part that leads towards the decarbonization.

The transport emissions, which currently account nearly 15 per cent of the total emissions (2010 year data), are the cause of air and noise pollution, especially in cities. If mobility, based on the current model, remains unchanged and dominant practice in the region by 2050, energy con-

* Countries that have developed an energy model based on Calculator 2050 are: Great Britain, Belgium, China, South Korea, South Africa, India, Japan, Taiwan, Mexico, Colombia, Bangladesh, Vietnam, Thailand, Indonesia, Nigeria, Switzerland, Austria and Australia. Algeria, Brazil and Hungary are in the process of creating this model.

Photo: SEE 2050 Energy Model / http://bit.ly/SEEenergymodel

sumption and emissions of harmful gases in the transport sector will increase by almost 50 per cent compared to today's values. Contrary to this scenario, improving vehicle efficiency, moving from gasoline and diesel to electric motors and progress in logistics planning and smart routes will contribute to reducing energy consumption and dependence on predominantly imported oil by 2050.

Relying on the expected trends in the EU, this scenario of transport development suggests that 80 per cent of road vehicles by 2050 will be on electric or combined hybrid drive. At the same time, it is expected to reduce the use of cars, especially in cities and for short drives.

Examples offered by countries such as Norway, where up to 50,000 electric vehicles were registered by April 2015, bring important and incentive policies such as tax exemption, the advantage of obtaining parking or the ability to drive on bus lanes. At the same time, the electric vehicles market is evolving rapidly, new models for electric transport are introduced, along with the expected decrease in serial production costs.

Cost analysis of different scenarios in the model shows that the path to clean energy will not be more expensive than the current plans: in the long run, countries can save money thanks to higher energy efficiency and energy savings. Although significant investments in public transport, biking networks, and urban planning are required, capital costs and fuel costs by 2050 will be lower than in a scenario that suggests an increased use of cars.

Relying on the expected trends in the EU, this scenario of transport development suggests that **80 per cent of road vehicles by 2050 will be on electric or combined hybrid drive**

Translated and revised excerpt from the publication: South East Europe, The EU Road or the Road to Nowhere, An energy roadmap for 2050 – A guide to the future

Photo: (up) Pixabay.com • (down) Joshua Brown (CC BY-SA 2.0)

Adnan Bosović

THE BALKANS HAS TO KEEP UP WITH EUROPE

Adnan Bosović, electrical engineer and expert associate for the development of distributive, energy efficient facilities in the Sector for strategic development in PE Elektroprivreda BiH – Sarajevo, has explained to us the situation in Bosnia and Hercegovina regarding ecomobility, how popular energy efficient cars are and also the situation with charging infrastructure.

EP What is the situation in BiH in terms of e-mobility? What is the percentage of hybrid and full electric cars?

Adnan Bosović Year after year, the number of hybrid cars, which have come on the market much earlier, is increasing. However, these vehicles cannot be charged from the grid. PE Elektroprivreda BiH – Sarajevo has recently purchased the first two electric cars in BiH Mitsubishi iMiEV and Volkswagen e-Golf. I do not have information on the usage of plug-in hybrid cars in BiH. There is also a small number of transformed electric cars.

EP In your opinion, what is the reason for a small number of this vehicles in wider use?

Adnan Bosović It is evident that the market of electric cars in BiH is still at a very early stage of development. However, as in other sectors, it is expected that BiH will also achieve the EU's level of development of the electric cars market with a certain delay. Given the fact that the sales price of the electric cars is still quite high, the key precondition for this is the introduction of incentives.

EP What are all the obstacles which byers but also importers encounter when buying electric cars in your country?

Adnan Bosović So far, two brands which EP Elektroprivreda BiH – Sarajevo has purchased, are present on BiH's market. Service equipping and training of service's personnel is being performed only now. Both buyers and importers have difficulties with but the purchase of electric cars due to the limited offer on the market and larger orders in the EU countries. Other obstacles for the general use of electric cars are lack of public and private charging infrastructure and the drivers' fear of disappearance of energy before reaching their destination due to the limited reach of the existing electric cars.

EP Do you expect that BiH will soon provide subsidies to importers of electric and hybrid vehicles as well as tax reliefs to the owners of these cars?

Adnan Bosović I believe that it is necessary to insist on introduction of different incentives and benefits according to the model of EU countries, since this is the key precondition to finally start with significant sale of electric cars in Bosnia and Herzegovina.

All photos: PE ElektroprivredaBiH – Sarajevo

EP Does PE Elektroprivreda BiH – Sarajevo influence a change in legislation regarding the simplification of electric vehicles' registration?

Adnan Bosović Up to this moment it was early to start with this kind of initiatives, but we notice that the public has matured for the progress in this regard, so we hope to see some concrete steps in the near future.

EP When do you expect for charging infrastructure, that is the network of charging stations to be built in BiH?

Adnan Bosović There is already a certain number of chargers for electric vehicles in BiH, primarily in the city of Sarajevo. A good part refers to the chargers in car showrooms, that are intended for their own usage. The first public charging station in BiH was installed by the Hotel Residence Inn Marriott in Sarajevo in 2016, but it is intended only for the hotel guests. The first charging station that PE Elektroprivreda BiH – Sarajevo has installed is placed in front of the Directorate building at 15 Vilsonovo šetalište in Sarajevo. The charger is in the function and we expect its promotion soon. Charging will be free of charge for all owners of the electric vehicles until further notice. In the years to come we will certainly be witnesses of the spread of charging network and charging stations for electric vehicles in BiH.

EP Does PE Elektroprivreda BiH – Sarajevo plan to connect with international corridors that is to enable travellers from Europe to charge their electric vehicles n BiH without difficulties?

Adnan Bosović If BiH wants to connect to international corridors on which electric cars will run, the development of high-power DC chargers is certainly an imperative. Of course, we are aware of the importance of these charging stations, but it's too early to talk about concrete locations and their number.

EP When do you expect that the things in the Balkans will change for the better and what steps should be taken?

Adnan Bosović Time passes quickly and the sector of electromobility is rapidly evolving, so the Balkans needs to keep up with Europe, which means that incentives and different tax reliefs should be introduced, then invest into the charging network for electric cars, as well as purchase electric cars.

EP What number of cars can the existing distribution grid endure?

Adnan Bosović We have done detailed analyses on the impact of electric cars' charging on our distribution grid on which basis we have developed several scientific and expert papers. The results show the average percentage of electric cars breakthrough, from which we do not expect major problems, is 5-10 per cent. This means that the distribution grid is not an obstacle for the introduction of electric cars. Of course, the problems may occur locally, in certain places, but operators of distribution system have established ways to increase the capacity of their grids. Naturally, for greater breakthrough of 20-50 per cent, the problems are big and much is changed, but on this topic there are many scientific and expert papers.

EP What impact on change does your team of innovation experts have in this sector?

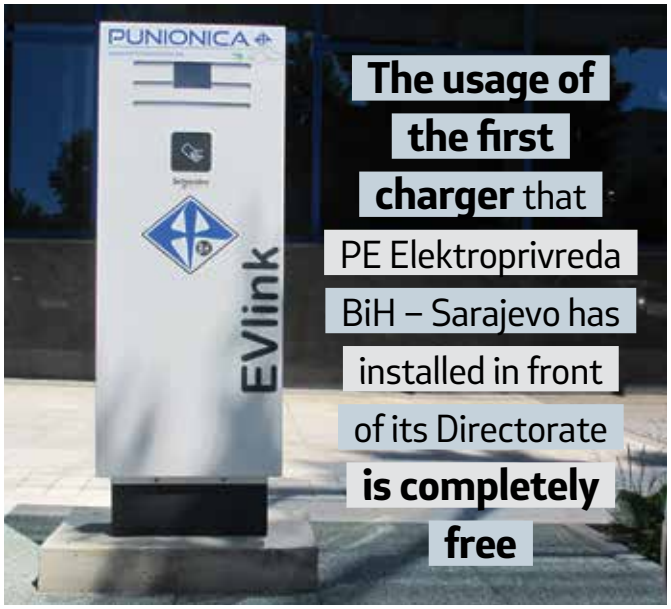
Adnan Bosović Sector for strategic development in PE Elektroprivreda BiH – Sarajevo is among other things in charge with pilot projects and the introduction of new

Drivers' fear of disappearance of energy before reaching their destination **represents a huge obstacle when determining for the purchase of electric cars**

technologies in our company, so our role in the sector of electromobility is thus clear. We carry out our activities with the help of other sectors. For example, the pilot project of the first charging station could not be possible without the Sector for General Affairs and Elektrodistribucija Sarajevo. The development of electric cars' market will certainly be supported by many other subjects such as car sellers, environmental funds, municipalities, ministries and other institutions.

EP Since you have recently showed your first electric cars, can you tell us something more about it? What are its characteristics, what battery does it have and what is battery's capacity? How many kilometers has it crossed so far? Have you thought about installing solar panels on its roof?

Adnan Bosović So far we have purchased two electric vehicles as part of the fleet of PE Elektroprivreda BiH – Sarajevo. Those are Mitsubishi iMiEV and Volkswagen e Golf. Mitsubishi iMiEV is a small city car for 4 people whose motor has the power of 49kW and the capacity of battery is 16 kWh which allows maximum range of 160 km. Volkswagen e Golf is an electric car for 5 people and the power of motor is 100 kW, the capacity of its battery is 35.8 kWh and its range is 300 km. For the time being, the Directorate of the company will use them for local tours in Sarajevo. The cars are serially produced so we are not thinking about their refinement in terms of installing solar panels.



The usage of the first charger that PE Elektroprivreda BiH – Sarajevo has installed in front of its Directorate **is completely free**

EP Tell us something about the chargers you are working on, how fast are they?

Adnan Bosović The first charging station, that we installed was equipped with two Mode3 type 2 connectors, is envisaged for AC charging of 2 vehicles with a maximum power of 2×22 kW. It should be pointed out that the power of AC charging of electric vehicles depends on the power of rectifier in an electric vehicle that is limiting. So, Mitsubishi iMiEV is charging with a power of 3.7 kW at our station and Volkswagen e-Golf with a power of 7.2 kW.

EP Since you had a chance to drive an electric car, can you describe us your impression?

Adnan Bosović I had a chance to of course drive our two recently purchased electric cars, as well as some others during the business visits to the countries in the region. The greatest subjective difference in comparison to the vehicles with manual transmission is that everything is automatic in electric cars. In addition to that, a great acceleration of electric cars has made a powerful impression, but also the fact that they are unusually silent.

EP Do you have any message for the drivers – pollutants for the end?

Adnan Bosović The massive use of electric cars is the future and that is something that is already happening in developed countries all around the world. The selling price is still relatively high, but it will definitely fall with greater mass production and with the development of technology. The introduction of incentives makes these cars more affordable to ordinary people and thus we need to insist on their introduction in the countries of our region.

Interview by: Vera Rakić

INSURE YOUR ELECTRIC VEHICLE

Serbia is in the beginning stages of introducing electric vehicles on the market. However, it does not have a developed network of charging stations, but it is believed that the situation is going to resolve itself. Very soon, it will not be enough for vehicles to only have zero emissions of harmful gases. The entire process will have to be clean, from manufacture to recycling. Our country has plenty of room for improvement, especially regarding the benefits for electric car owners and establishment of the network of charging stations, which are key drivers when selling these vehicles and changing the attitudes of drivers. We believe that Serbia will decide to implement the best practices from the region and the EU.

Regardless of what type of fuel your car uses, the risks remain and economic profitability may be brought into question, but only if you are not insured.

DDOR casco insurance of motor vehicles provides security and protection in case your vehicle is damaged or totalled due to occurrence of various risks and sudden drastic events. Our company allows you to choose for yourself which risks you are to insure your vehicles against. You can also choose the method of payment.

Casco insurance is the safest way to protect your car in terms of indemnity received if the vehicle is damaged or even totalled. You must have wondered a hundred times whether you need casco insurance, especially if you are driving an older car. The facts speak for themselves: 60,000 traffic accidents occur in our country each year, and the covered losses amount to nearly 50 million euros, whereas as much as 45% of damage is done on parking lots by unknown persons. It is good to know that the average claim amount paid per vehicle due to traffic accidents is 1,000 euros. In addition to material losses that may be covered, there are losses that no amount of insurance can cover – life. In dangerous traffic situations, your knowledge and experience are what saves you.

This is why "DDOR Novi Sad" is the only insurance company that gives priceless experience to all its insureds who purchase a casco policy with annual premium of over 200 EUR, which they can gain during the training course in safe driving at the National Driving Academy NAVAK. This gift is bestowed on all insureds, regardless of whether they are insuring their vehicles at "DDOR Novi Sad" for the first time or are renewing insurance.

- Gift – initial training course in safe driving – with every casco policy with annual premium between 200 and 400 EUR;
- Gift – intensive training course in safe driving – with each policy with annual premium exceeding 400 EUR;
- Additional 10% discount on casco premium for the following year – for all insureds who complete the training course in safe driving for basic risks;
- A 5% discount on the number of years as driver;
- Discount on cash payments.

With special consideration to the environment and ecological issues (in terms of decreasing the emissions of harmful gases while driving), DDOR Novi Sad added to its sales network three Toyota hybrids (containing both a gasoline engine and an electric motor).

DDOR OSIGURANJE
motor vehicles – for drivers www.ddor.rs

Foto: DDRR Novi Sad

Photo: Pixabay

EVERYTHING IS BETTER WITH COMPANY AND ON FOOT OR BY BIKE IS THE HEALTHIEST

Although this issue of our bulletin is largely concerned with electric vehicles, the real supporters of green traffic and ecological mobility are actually cyclists and pedestrians. "Fat cyclists", "Just not by car", "Streets for Cyclists" and "Critical Mass" – these are just some of many actions that citizens from urban areas have, who spontaneously gather together and spread the idea of environmental protection, healthy life and need for cleaner air in cities. And, of course, they enjoy cycling and hiking. We are using this opportunity to present them to you.

FATCYCLISTS

It comes as no surprise that not everyone is born to have athletic build throughout his life and to fit the standards of a classical athlete who brags with his slender body in tight latex Bermuda and even tighter top. However, the fact that we often enjoy doing nothing as well as having a good bite, should not prevent us from enjoying a light ride on a bicycle out of pure hedonism.

An example of this way of life is an informal group that presents itself as Fat cyclists. It brings together the lovers of culture, art, food, and drinks, who fight, with all their heart, with numerous actions for "green" streets and clear air.

Ivan Tobić, one of the founders of Fat cyclists, popular Smederevo and Belgrade musician, revealed why their rides and actions are real treats for those who love cycling, ecological activism and art, but also delicious food.

Photo: Debeli biciklisti

Photo: (first) DragutinTobić• (other) Fatcyclists

– We crossed more than a thousand kilometers on bicycles in order to play concerts, we grilled, and shared with friends, "cyclesauge"- a sausage in the shape of a bicycle, worthy of the Guinness World Records. We built recycled parking for fat cyclists, led the ban on the use of cars at Zemun Kej and each Easter traditionally organized a knightly tournament in egg cracking on bicycles.

– The trip to Florence, within the Ciklomotiva project, which motivates people to recycle cans or other materials, was one of the most inspiring efforts of the members of this small renaissance circle. All those who follow our travelogues, sort of picaresque novels, enjoy in our adventures as well. They inspired many to use bicycles as the most ecological and the healthiest way of moving – explains Ivan.

JUST NOT BY CAR

The campaign "Just not by car"is being conducted in Belgrade as a one-day challenge for companies and public institutions. On the day of the competition, participants register their teams that will come to work on foot or by bicycle on that day (just not by car).

In the first year, 425 individuals from 36 companies and public institutions took part in the competition. Par-

ticipants of "Just not by car" cycled or walked just over 4,000 km. In the second year of the competition, on the day of the challenge, 18th May 2017, 611 competitors from over 60 companies took part and crossed a total of more than 9,000 kilometers.

– The campaign aims to encourage companies and public institutions to think about urban mobility and motivate their employees to use alternative modes of transport. At the same time, the campaign affects the visibility of cyclists in Belgrade and shows us what Belgrade could look like if everyone would come to work "just not by car" – said Danilo Ćurčić, one of the organizers of this campaign.

The next action within the campaign "Just not by car" is planned for the European Mobility Week, in September 2017.

Photos: Just not by car

Photos: Bogdan Spasojević

STREETS FOR CYCLISTS AND THEIR "CRITICAL" MASS

The Citizens Association "Streets for cyclists" is engaged in the promotion and public advocacy of bicycles as a daily means of transport in Belgrade.

– We are in favor of greener traffic because it is healthier for all of us. The idea of our association is to urge drivers of motor vehicles to look after cyclists in the streets on one hand, and on the other hand to encourage the construction of as many cycling tracks as possible so that we can pedal safely everywhere – said Zoran Bukvić from the association "Streets for bicycles".

"Critical Mass" is an event organized around the world, and the idea is to draw attention to the problems of cyclists and as well as to promote bicycles as a mode of transport. Recently, 75th action "Critical mass" was held in Belgrade and the end of the ride there was a traditional picnic, which was held this time at Kalemegdan, below the Nebojša Tower.

– We gather every last Saturday in the month, no matter what the weather conditions are. Come! In addition to the fact it is fun to ride a bicycle with a company, "Critical Mass" is always an action for itself, as each carries a unique message and aims to draw attention to a specific, current problem that cyclists and other citizens face atthe given moment – said Zoran.

Prepared by: Vera Rakić

Miroslav Tadić

The United Nations Strongly Support the Transition of Serbia towards Ecomobility

The United Nations Development Program (UNDP) is helping the transition of the Republic of Serbia through the achievement of the Sustainable Development Goals (SDGs), which define priority areas of development in the world until 2030. Through a series of projects and programs implemented in cooperation with government institutions, local self-governments, private and civil sector, UNDP has been actively advocating for the establishment and development of urban mobility in cities throughout our country for more than a decade. We tried to find out from Miroslav Tadić, the Portfolio Manager of UNDP in Serbia, why the establishment of sustainable transport is of utmost importance and what the possible ways of operation are.

EP To what extent is the establishment of sustainable transport important for adapting to climate change and mitigating effects? How much can the development of ecomobility contribute to reducing CO_2 and other GHG emissions?

Miroslav Tadić At the meetings of the UN Framework Convention on Climate Change, it was concluded that urban areas alone represent the largest additional potential for the reduction of GHG emissions, especially in relation to the tendency to keep the rise in the average global temperature below 2°C by the end of the century. This is primarily important in relation to the obligations that the countries undertake by signing and ratifying the Paris Agreement. It is of great importance to note that the Republic of Serbia ratified this international agreement in 2017.

The significant role of cities in combating climate change is also emphasized in the Global Emissions Gap Report prepared by the United Nations Environment Programme. Consequently, traffic becomes more important, not only as a problem but as a potential to reduce emissions. At EU level, it is estimated that traffic contributes to a quarter of total GHG emissions and is certainly the leading air pollutant in urban area. In response to this challenge, the EU has strategically planned to significantly reduce GHG emissions from the transport sector and to focus on the path of low-carbon mobility. This implies a strategic commitment to reducing the emissions from the transport sector by 60% compared with 1990 levels, by 2050. The Republic of Serbia, as a candidate country for EU membership, must certainly follow not only the global but especially the EU trends. The motive for reducing the emissions from the transport sector should be much higher and we should primarily take care about the health of people and the quality of the environment of urban areas.

EP Does the use of electric cars make sense if the fossil fuel energy is still used to charge batteries?

Miroslav Tadić In principle, the effect is certainly lower and only temporarily postpones the inevitable conse-

Photo: (logo UNDP) UN.org • (Tadić) private archive

quences in terms of increasing GHG emissions. It would be ideal to increase the share of renewable sources in primary energy production parallelly with the introduction of electric cars. Serbia has an ambitious goal of reaching 27 percent of energy from renewable sources by 2020. This, in combination with the existing number of electric vehicles in Serbia (which is very small), is certainly not sufficient to significantly demonstrate the effect of reducing GHG emissions from the transport sector. The current situation in the field of introducing electric cars has a higher educational than practical significance, which can again be considered a progressive measure. A more important current measure is to improve the quality of the fleet by switching to more efficient low-emission engines.

EP Do you rely on the massive use of electric vehicles in our country in the process of establishing sustainable transport in the future, or do you see a greater potential in more affordable sustainable means of transport such as bicycles?

Miroslav Tadić Considering the demanding infrastructure that needs to be established for the purpose of more efficient and massive introduction of electric cars on the market of the Republic of Serbia, the greatest current potential is in the development of cycling. This means that bicycles are seen as alternative means of transport, and not only as recreation activity. An increasing number of new bicycle paths speaks in favor of that. Likewise, bike trails are set up in new and reconstructed streets, which is another encouraging piece of information. The Belgrade City Hall has recently hosted a conference of European countries, bicycle partners, with the support of the Ministry of Environment, the Ministry of Health, the Ministry of Youth and Sports, Provincial Government of Vojvodina, the City of Belgrade, private and non-governmental sector. At the meeting, it was emphasized that the preparation of logistics for the development of the Cycling Strategy, as well as the National Action Plan for Transport, Environment, and Health, is in progress. In addition, Belgrade, as the largest urban entity, has prepared a Study on the safety of cyclists in traffic. These pieces of information, as well as the large number of active cycling associations, point to the fact that cycling is really an important lever in sustainable traffic, both at national and local level.

EP Several years ago, the project "Support to Sustainable Transport in the City of Belgrade" was implemented by UNDP in cooperation with the Ministry of Energy and was funded by the Global Environment Facility (GEF). Can you briefly comment the results of the implementation of this project?

Miroslav Tadić The Project was a pioneering effort to introduce the concept of sustainable urban mobility planning. In this regard, the first Sustainable Urban Mobility Plan for the city of Belgrade was prepared, a series of awareness-raising campaigns on the importance of sustainable means of transport, especially cycling, were conducted, safe roads to schools for the youngest fellow citizens were established and horizontal and vertical signalization was set in the vicinity of several schools in the centre of Belgrade. Also, bicycle paths to Avala and Bojčinska Forest. Based on the results of this project, Belgrade continued to promote cycling, mark bicycle trails, mark slow traffic areas near schools, etc. Also, during this project, a campaign "Let's Cycle in Belgrade", was launched, whose effect was primarily visible in the area of greater commitment of decision-makers in promoting alternative forms of urban mobility. One of the important segments of the project was the training of public transport drivers for the so-called "Eco-driving" -

Photo: Pixabay

Cycling is a really important lever in sustainable traffic measures, both at national and local level

this type of training has proven to bring significant savings in fuel and resources in public city transport budgets.

Likewise, the project has also produced a Guide to Sustainable Urban Mobility as an ancillary plan for all local governments that want to implement similar measures and activities on their territory. All in all, the project was an excellent introduction and support for further activities that Belgrade is implementing in terms of reducing the negative effects of traffic on the environment, health and safety of people.

In May this year, UNDP was one of the organizers of the action "Just not by Car". This type of activity is very important also from the aspect of corporate social responsibility in the Republic of Serbia. The aim of this campaign was to encourage employers to motivate employees to use of alternative forms of transport. Of course, this action is also an opportunity for every individual to easily respond to the climate change challenges, simply by using bicycles or hiking on their way to and from workplace. By popularizing such activities, their effect on the sustainable development of transport will be increased, the emissions of harmful gases will be reduced, and the quality of life of the citizens will be improved.

EP Recently, the start of the Climate Smart Urban Development project was marked by an introductory workshop where you announced a challenge program that should include the local community. Can the development of the road infrastructure for the sustainable transport in our country be considered challenging?

Miroslav Tadić Traffic is certainly a part of the planning of local development resistant to climate change. It is necessary to keep in mind that the transport, as much as it is the cause of climate change, certainly suffers from the effects of climate change. In this regard, the planning of sustainable transport measures needs to be done with respect to future climate change, so that this sector becomes even more resistant to climate challenges..

Interview by: Marija Nešović

Most of major cities in the world face transport problems, starting from an increase in traffic jams and an increased number of traffic accidents to constant noise pollution and high levels of emissions of harmful gases, including greenhouse gas emissions. Traffic currently accounts for 30% of total energy consumption in the EU. Half of the total fuel used in road traffic burns in cities. About 98 percent of the energy market related to the traffic depends on oil, most of which (75 percent) refers to road transport. Based on these data, it is evident that traffic significantly contributes to climate change and is at the same time a significant factor in the fight against climate change. The development of sustainable forms of transport is a direct contribution to the reduction of GHG emissions in urban areas where the intensity of traffic is the highest.

Photo: Pixabay • (logo) UN.org

ROAD ARROW

Team of students – formula lovers

Road Arrow is the first Serbian Formula Student team whose members are the students from the University of Belgrade. For seven years now, this group of enthusiasts and formula lovers have created vehicles that represent their university and Serbia at prestigious engineering competitions in the world. In the current season, the Road Arrow team has more than fifty members from the Faculty of Mechanical Engineering, Electrical Engineering, Metallurgy, Transport and Traffic Engineering, Physics, Forestry, as well as Faculty of Organizational Sciences and Faculty of Applied Art.

Year in, year out, Road Arrow goes to various competition with a formula that is always better than the one made in the previous season and there are notable results and numerous awards.

The reason for the conversation with members of the most perspective student project at the University of Belgrade is the recent promotionof the sixth vehicle "Road Arrow 2017", as well as their ecomobility project, which is in the process of being formed.

EP How was the idea of creating a Serbian formula launched?

Drumska strela Initially, the team consisted of 12 students who learned from their colleagues from Rijeka about the Student Formula project and wished to create the formula themselves, in order to represent the University of Belgrade and the Republic of Serbia at this international engineering competition. In the first year, they developed only the car concept design and competed in Class II in Silverstone, UK, where they took the third place. The following year they went to Silverstone with a completed formula. Over a hundred students have passed through the course and 6 vehicles have been made since then.

EP What are students' motives to join your team?

Drumska strela Motives are different, from the fans of auto-moto sport that study at one of the technical faculties, to the students of social faculties who can apply their knowledge to this project. At first, students are interested in good practice and the opportunity to participate in a prestigious competition, but after a season spent on the team they get a completely new image on Road Arrow. As observed, it is obvious that the teamwork and gaining experience in this complex project bring a lot of benefits. However, later, reasons for staying on the team are much more complex and nicer.

EP What is the driving energy in Road Arrow?

Drumska strela It is, above all, the fact that Road Arrow was created thanks to enthusiasm and resistance to various problems that stood in the way of making the first vehicle and going to competitions. Also, there is a good atmosphere

All photos: Road Arrow

on the team and a common goal that is passed on from generation to generation.

EP Do students exclusively work on this project or did some of the professors come to help?

Drumska strela The team structure has changed completely since 2010, but the essence of Road Arrow remained the same. Effort, cooperation, thousands of working hours each season and team spirit keep this project active and with more quality year after year. According to the competition rules, all team members must be students, but the difficult and responsible task of creating a formula would neither be possible, nor safe, without constant support and advice from professors. Also, the team has great assistance from former members, who keep up with plans for each season and without whom Road Arrow would not be what it is.

EP Which technologies were used during the process of creating the vehicle? What is the biggest trump card of Road Arrow?

Drumska strela Vehicle production is divided into sub-teams, which deal with different systems on the vehicle. Specifically, in the design of "Road Arrow 2017" sub-teams Chassis and Handling, Aerodynamics and Design, Powertrain and Electronics and Materials took part. It is interesting that all parts of the vehicle were designed and produced by students themselves and only parts such as engine, tires and wheels are purchased.

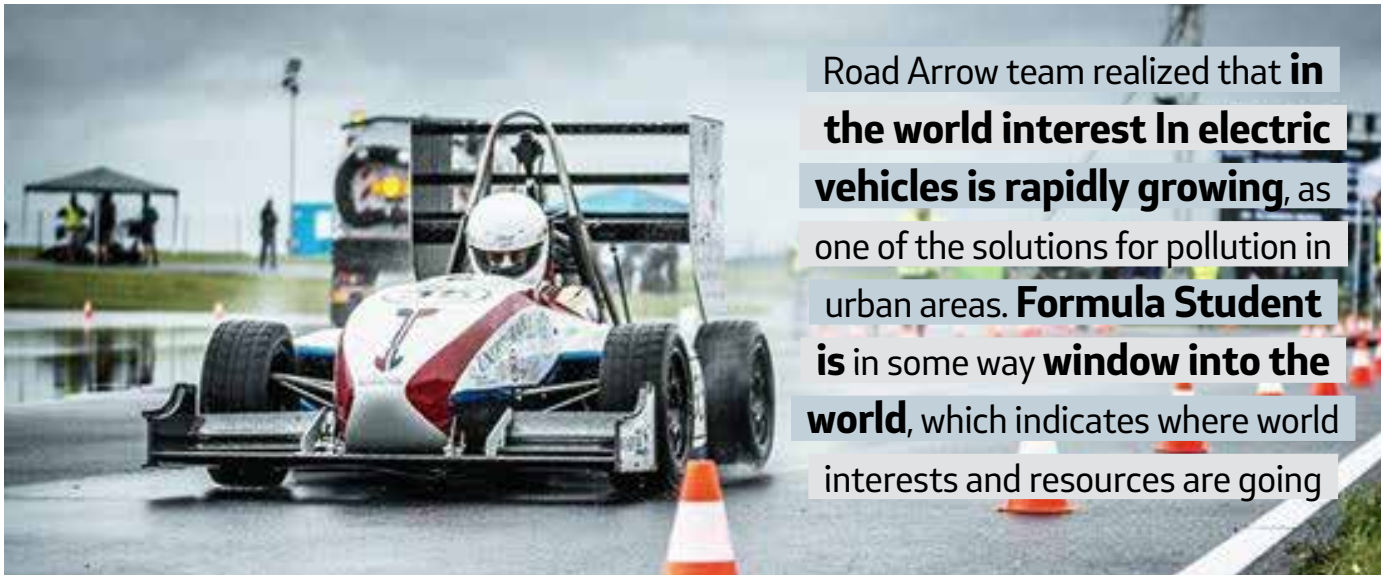
Of the innovations introduced, the interesting thing is the use of carbon fibers for the production of the whole aero package, driver's seat, steering wheels, electronic boxes, as well as many other parts where the mass is significantly reduced in the same way. This has contributed to the vehicle's better performance, which is the practical goal of the team – to make the best formula possible with their knowledge and innovation. By realizing their ideas, Road Arrow has been created, a student formula that reaches a speed of 100 km/h.

The team of the Belgrade University became recognized throughout Europe for its rapid progress, since the second formula was lighter than the previous one by as much as 40 kg and had a maximum power of 16 kW. Already on the third vehicle, the first aero package was presented, as well as the inlet chamber of variable geometry, and in the fifth they introduced parts made of carbon fibers, such as those in Formula 1. The biggest success of the team so far is the 10th place in the competition of 43 prestigious teams in the competition in Italy in 2013, and 4th in the race of endurance, the most demanding discipline, in the Czech Republic 2015.

EP In May this year, the sixth vehicle was presented. What characteristics have been improved in comparison to previous vehicles? Where will Road Arrow race in the next season?

Drumska strela "Road Arrow 2017" is the sixth vehicle of this team and it is the result of many years of advancement that led to the development of formula with the most optimal technological solutions up to now. Significant improvements have been made in handling system and driver's ergonomics, and the mass of the vehicle has been reduced and the balance is lower. Its own radio communication was developed, changes were made to the aero package, and the use of 3D printed parts was expanded. We expect that this car will be the best so far, that we will soon be able to see, after the first competition that takes place on July 19th in Italy. After that, we will compete in the Czech Republic, from there we will travel directly to the biggest and most important competition in Europe that takes place on the track in Hockenheim in Germany. It will be the third appearance of Road Arrow on Formula 1 track in the competition of the best teams around the world.

EP You have recently announced the development of an eco-vehicle, so tell us which technologies will be used? Will it be hybrid or electric vehicle?



Motives for joining Road Arrow are different, the team is very colourful:

from fans of the auto-moto sport who study at one of the technical faculties, to the students of social faculties who can apply their knowledge on this project

Drumska strela Last year, the idea of creating an electric vehicle was born. There is a special class within the Formula Student Competition, which is becoming more increasingly popular, due to the ecological significance of the reduction of CO2 emissions from vehicles. By participating on this project, students learn how to design and make an electric vehicle, so they may later, during their professional career, be given the opportunity to develop passenger vehicles that operate in the same principle. Last year Road Arrow came up with the design concept for the electric vehicle and won the praiseworthy third place in Italy. The concept is a vehicle that has two electric motors on the rear wheels, with alternate current supply of variable frequency. The battery of the electric vehicle is made of batteries and our team decided to use lithium-ion cells. Also, there is a concept of a variant with four electric motors, one at each wheel, which requires a more complex control algorithm.

EP How did the team decide to further develop the formula in the direction of ecomobility? Is the motive of being driven on alternative drives currently trendy or the reason is sustainable future of racing cars?

Drumska strela Foreign teams have been making electro formulas for years and they have a huge support. The world's largest automotive companies finance these projects because it is an investment that will pay off in multiple ways. The sticker on the vehicle is a trifle in comparison to the knowledge and experience of young experts who leave Formula Student teams to go to positions with big responsibility in companies where they apply everything they have learned. Road Arrow team saw the growing interest in electric vehicles, which is one of the solutions in the fight against pollution in urban areas. Students work on innovations and development in the industry and they could be able to help Serbia's economic growth in a short time. The conclusion is that behind the engineering challenge of completely new and different vehicle, there is an economic aspect that is both important in the competition and in a future career.

EP How will the battery and charger be solved when the concept of an electric vehicle turns into a new formula?

Drumska strela We are just working on the concept of an electric vehicle. A total of 720 individual lithium-ion cells are connected appropriately to achieve the required capacity, and the capacity itself is determined based on computer simulations. The charger is powered by a three-phase AC 400 V voltage supply, and can be used anywhere (in a workshop, at a competition or some other event). This charger provides a very simple adjustment of the voltage and current at the output, and can be adjusted to charge other lithium-ion batteries. To charge the battery, it takes a little more than one hour.

Interview by: Marija Nešović

HOPE FOR DOMESTIC AUTOMOTIVE INDUSTRY

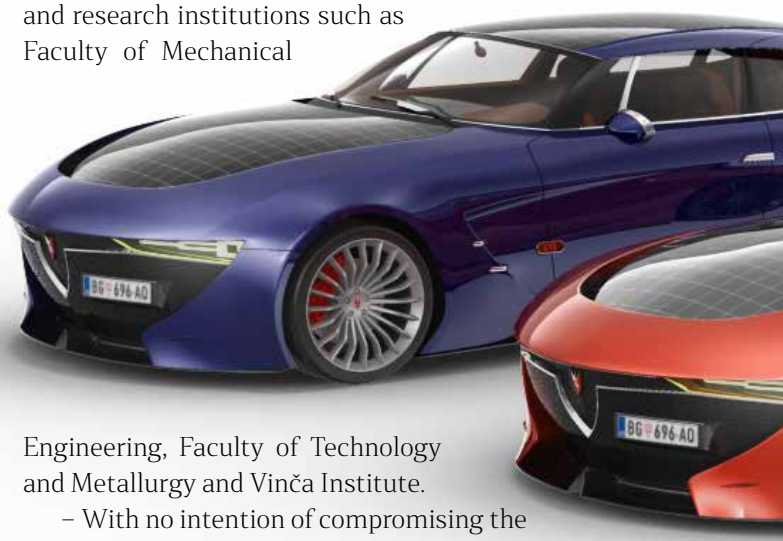
Company AQOS Technologies gives us trust in the possibility of developing the car industry in Serbia after years of silence in this industrial branch

In order to present to our readers innovative solutions from AQOS Technologies, implemented in the current prototype model AQOS and find out when will their long-term research turn into a means of transport, that we will often see on the streets, we talked to Mr Saša Milovančević, the founder of the company, a graduate architect, affiliated designer and constructor in automotive industry.

We are witnessing that at this moment, "green" cars represent a world trend and that the largest automotive companies have made significant efforts in the research and development of electric and hybrid vehicles in recent years. During his rich career, Saša Milovančević had the opportunity to work very successfully with some of the most important companies in the automotive industry.

As an initial motive for the creation of a new brand, Milovančević cited the need to redefine the entry approach to the development of a new automobile brand that has the ability to respond to the challenges of the modern era. So far, AQOS has presented prototypes of more than ten modern cars, which have already become recognizable among high-performance vehicles.

The idea of projects that AQOS Technologies develop is the platform for the integration of scientific, technological and technical research, which is corroborated by the cooperation and support of numerous educational and research institutions such as Faculty of Mechanical Engineering, Faculty of Technology and Metallurgy and Vinča Institute.



– With no intention of compromising the idea of coupling electric cars with ecology, electric cars have advantages over classical, even when the environmental impact is excluded. AQOS, as a brand, has undertaken research on all limitary issues. Contemporary design and technical solutions, combined with environ-

All photos: AQOS

mental awareness and the technologies that accompany all these, definitely represent the distinction that distinguishes AQOS from other brands. Although diversity is not a prerequisite for success, it is enough just to be better for the same subject – Milovančević was clear.

In the past decades, insufficiently explored options for the use of solar panels on cars have left room for tolerance in terms of aesthetics and functionality. The concept of an alternative-powered vehicle, such as an electric one, usually included massive batteries. When asked what had to be balanced during the development of the AQOS models and whether they were forced to give up on some aspects for better performance, Saša Milovančević answered sharply – We did not have to, we are AQOS!

– Of course, we cannot talk about all the technologies at this stage for obvious reasons, but in the first place, the use of nanotube-enriched composites and highly sensitive solar cell functional even with poor light are topical. But the least tested and strongest technology we use is the will to take the process all the way to the end, Milovančević told us.

Bearing in mind the current state of the road infrastructure for electric vehicles in the Republic of Serbia, we were interested in the team's assessment of the possibility of placing AQOS cars on the domestic and foreign market.

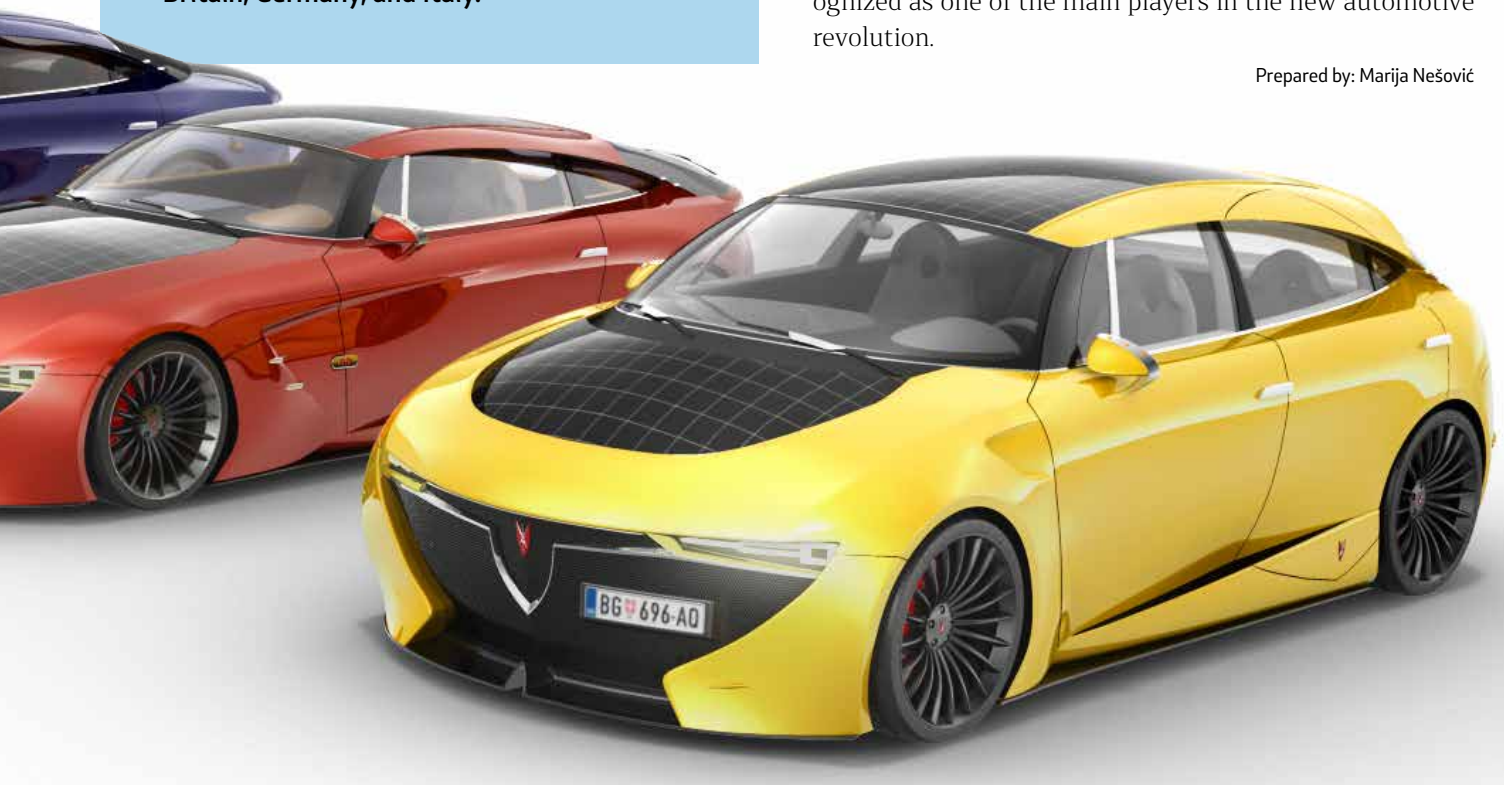
– The car is a global product and as such, it cannot be treated locally in any sense. As far as the assembly of the cars themselves, our intention is to do that in Serbia, but whether this will be achieved depends on many factors that we cannot influence to the full extent – Mr. Milovančević is clear.

While AQOS works hard on the development of solar foils that are adaptable and integrated to the design of the vehicle, we hope that this domestic brand will be recognized as one of the main players in the new automotive revolution.

Prepared by: Marija Nešović

AQOS TECHNOLOGIES

Established in Belgrade in the beginning of the current decade, AQOS has focused on research in all aspects of car development. Experienced experts in the field of design, architecture, technology, materials and other engineering sciences participate in the creation of vehicle prototypes under the auspices of AQOS, and this company consists of domestic and foreign experts from Great Britain, Germany, and Italy.



Aleksandar Vranić

I Would Like to See Post of Serbia Have an Electrically Powered Fleet

Aleksandar Vranić, with an MA in Economics, employed in the Economic and Procurement Service in PE "Post of Serbia", participated in the conference "The construction of electric vehicle charging stations in urban areas and road infrastructure" held in April 2017 at the Belgrade Building Trade Fair. On that occasion, he told the audience that he made a proposal for the project idea entitled "Advantages of introducing electric cars following in the footsteps of the European Post".

It always makes us happy when we learn that there are young people who want to implement energy efficiency measures in their companies and especially in such a large infrastructure system as "Post of Serbia". Considering that this bulletin is all about ecomobility, we asked Aleksandar to tell us more about the idea.

We should copy examples of good practice that we can see in European post offices

– The goal of my project is to improve the quality of life and increase the energy and economic efficiency, both in the institution where I work and in the entire society. This idea of "green mail" has already been realized abroad, where it is not uncommon that your shipments are delivered by electrically powered vehicles. Projects tested in EU cities have shown the justification of economic investment and great benefit for the environment and the results are great – said Vranić.

Out of all European countries that have electric cars today, Norway is the first in which "green" cars are most represented.

– The intention of this country is that these cars "come to life", and finally to completely replace "classical" cars in public services and economy. NorwayPost bought 300 electric cars, Renault Kangoo Z.E. which has a five-year warranty or 100,000. After the warranty expires, the battery of the vehicle runs at 66 percent of capacity. This is a great result and it is expected that the vehicles of the future will have even better performances – he added.

Aleksandar submitted his proposal to the development sector of PE "Post of Serbia" and the realization of his idea has been in the procedure since May 2017. The Norwegian Embassy has published its entire study on the idea of introducing electric cars.

The largest fleet of electric power vehicles is owned by French Post, which announced a tender for the procurement of 10,000 electric cars for delivery in 2017.

– The French team plans to significantly reduce annual fuel costs. In addition, the quality of traffic will be raised

Photo: private archive

to a higher level because the French Post and the Renault team together promote hydrogen–powered trucks. They already largely collect and distribute mail packages with such trucks – says Aleksandar.

He explained to us that our country could look up to France.

– The project funded by the European Commission in 2015, 200 fast chargers were installed on the main French roads, so, every 80 kilometers there is one station. If "Post of Serbia" does not wish to allocate funds for chargers, this can be overcome by applying for external sources of funding from the EU funds. –believes Aleksandar.

Another country that can serve as a good example is Germany, which is planning to replace all small delivery vehicles with electric vehicles.

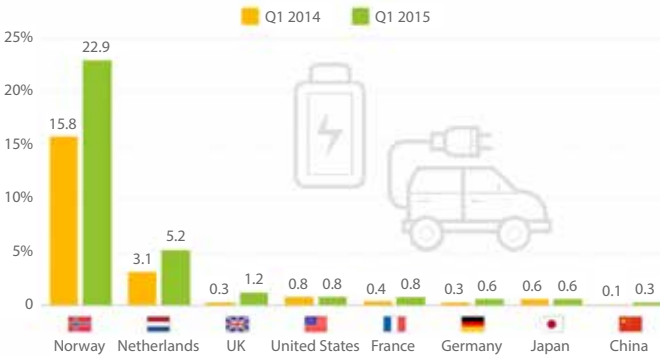
– German Post will provide its employees with 2,000 electric delivery vans. Germany's goal is to replace all cars (30,000) with electric cars that will be produced in Germany, for the time being, production capacities will be exclusively for the post, while later it is planned to expand capacities and offer "green" delivery vehiclesto other public services and companies – Aleksandar reveals.

Austrian Post also has a fleet of 1,300 electric cars. Austria, according to the latest data, has about 10,000 registered electric cars. Those cars will be more visible and recognizable on the streets, as they will have green license plates.

The advantage of electric cars is that they can be charged at home, at workplace, and in shopping malls.

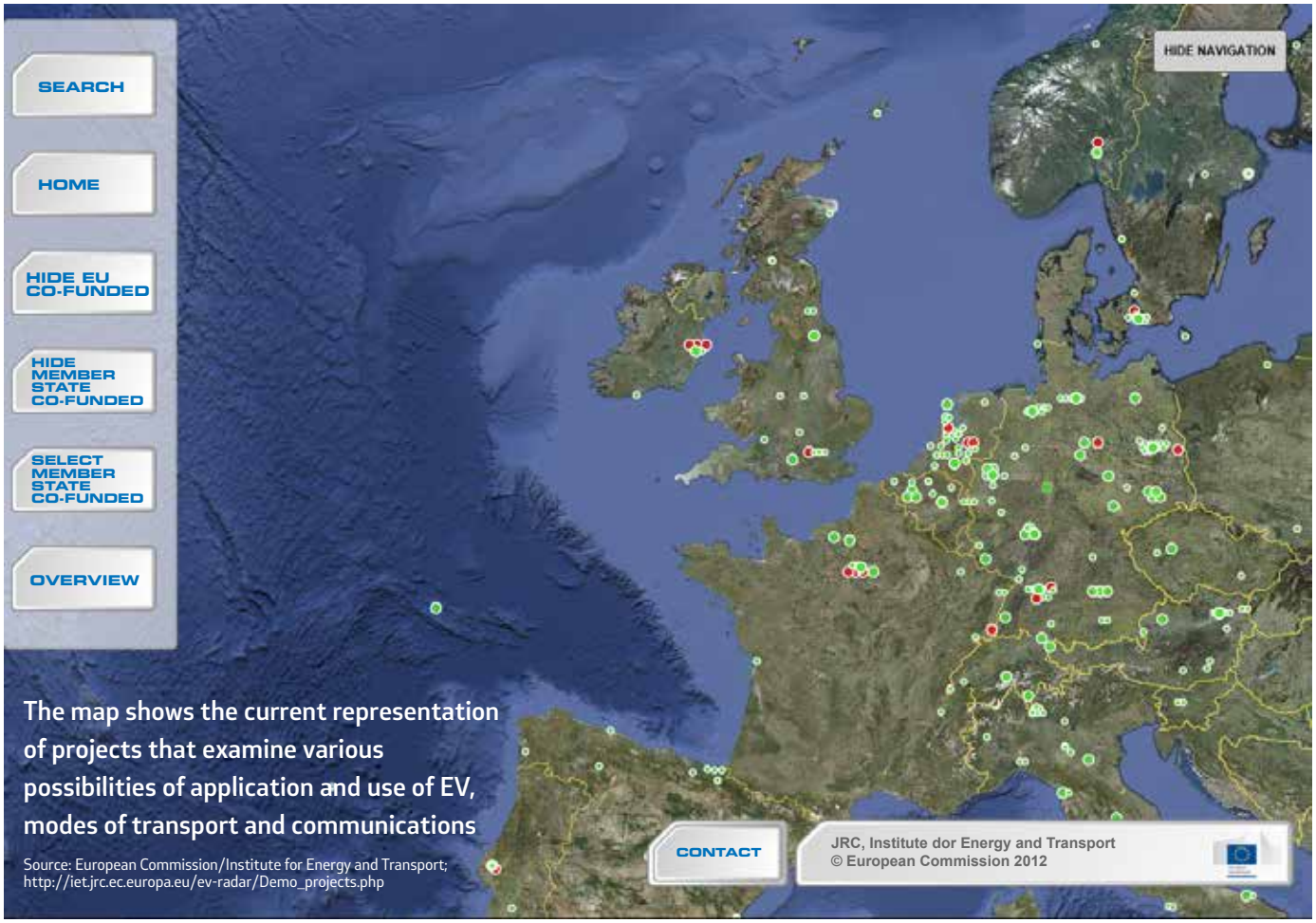
Taking into account the examples of good practice from the European Union, Aleksandar explained how he sees the "green post" of Serbia. According to his study, the appropriate electric car for our country would be Renault Kangoo, a delivery van with a range of 270 km.

– I have calculated that the electricity costs would be five times smaller than today's expenses when a lot of



In this chart, we can see that in Norway only in the first quarter of 2015, 23 percent of all new vehicles bought were electric ones

Source: Norway loves electric cars
http://www.businessinsider.com/norway-loves-electric-cars-2015-10

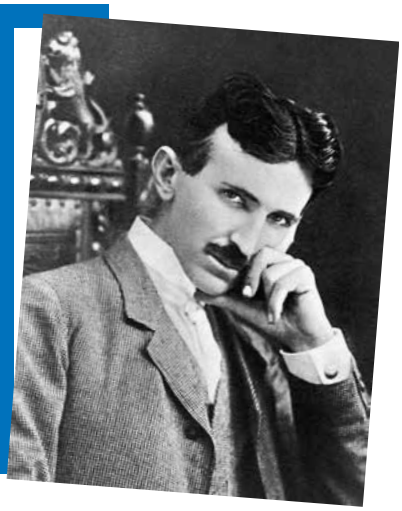


The map shows the current representation of projects that examine various possibilities of application and use of EV, modes of transport and communications

Source: European Commission/Institute for Energy and Transport;
http://iet.jrc.ec.europa.eu/ev-radar/Demo_projects.php

Foto: (Nikola Tesla) Wikimedia; https://en.wikipedia.org/wiki/Nikola_Tesla#/media/File:N.TeslaJPG

Aleksandar's greatest inspiration is Nikola Tesla, our famous scientist in the field of physics, electrical engineering and radiotechnics. In 1882, Tesla designed, produced and patented an asynchronous three-phase engine, that could serve as a generator at the same time. Exactly that engine, with the same parameters, was used by Tesla Motors engineers in the production of first vehicles

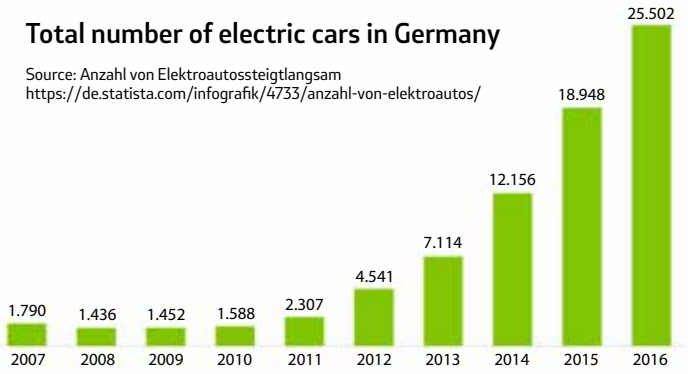


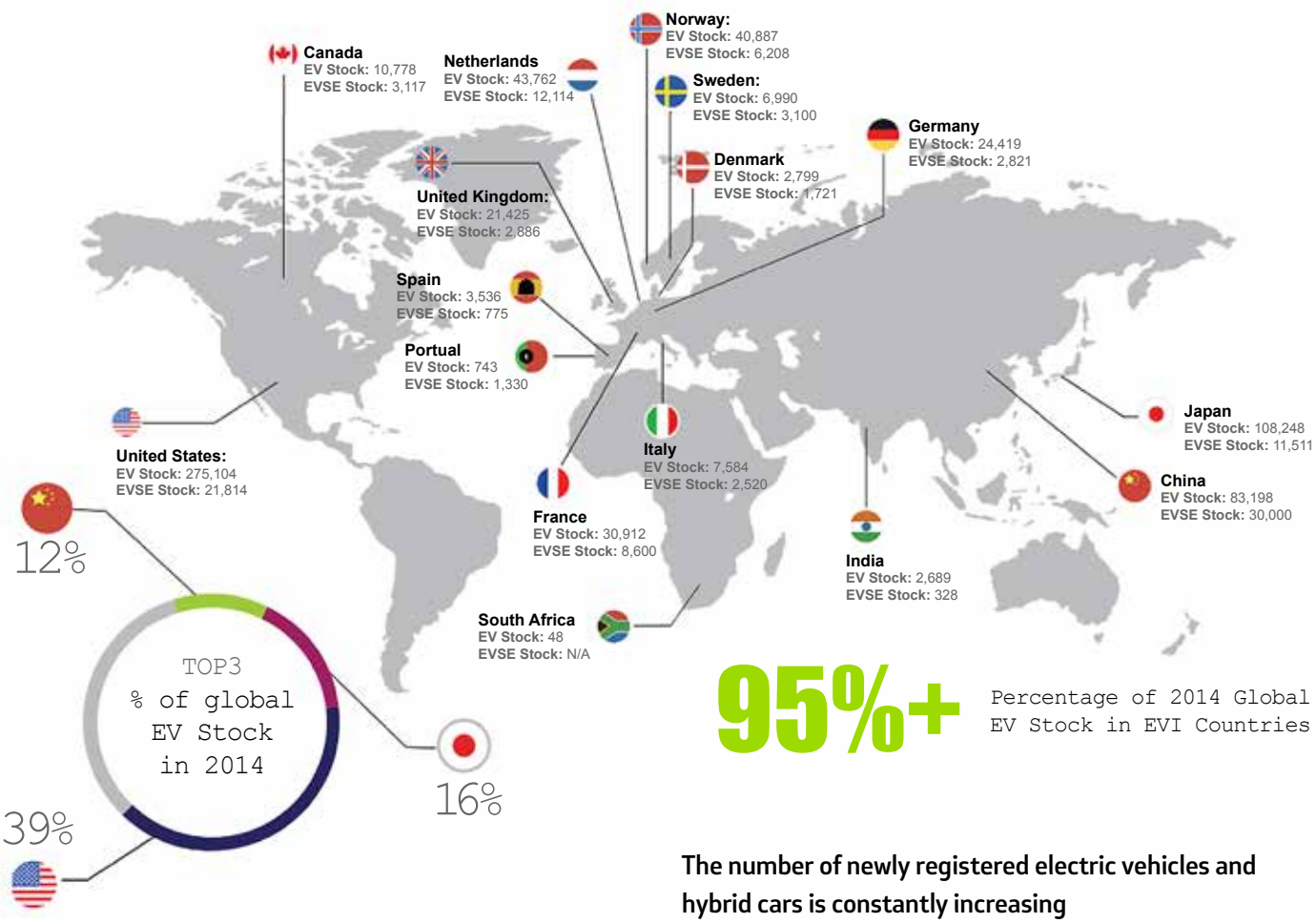
According to my project, Post of Serbia as the owner of infrastructure would offer service for charging electriccars to third parties

money is spenton fuel for sending and delivering packages. And this applies only to energy. The savings on everything that is needed for a classic car, and it is unnecessary for electric cars, such as engine oil costs, fuel, and oil filters, various belts, mechanical equipment and more, can be added to this. Not to mention the benefits for the environment – said this enterprising young man.

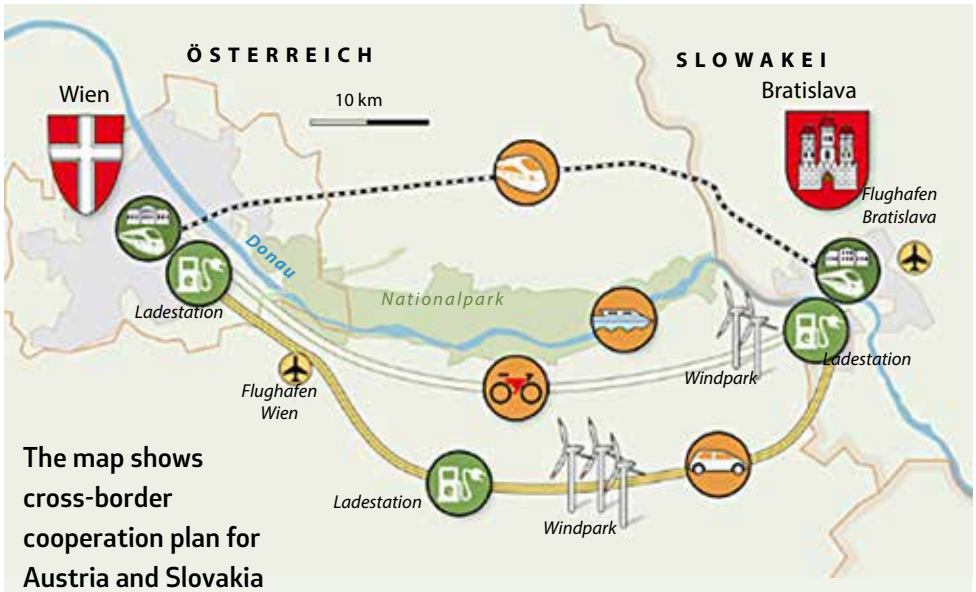
Aleksandar's project covers the whole Serbia, that is, his idea is that electric cars and fast chargers should be provided for all 28 postal centers in our country.

– Post of Serbia would have its own system and as the owner of the infrastructure, it would provide the





The number of newly registered electric vehicles and hybrid cars is constantly increasing



The map shows cross-border cooperation plan for Austria and Slovakia

Source: Other electric mobility initiatives; http://www.ieahev.org/by-country/austria-charging-infrastructure/

service of charging electric cars to third parties. My vision coincides with the practice in the world that confirms that the ideal distance for a charger is about 50 km, but as technology advances, so will electric cars and chargers, it will be possible to travel up to 100 km distance. By inspecting the map of working units of "Post of Serbia", it is clear that our company could respond to this request – he reveals.

Thanks to this project, Serbian Chamber of Commerce invited Vranić to join the team for dealing with ecological mobility in Serbia because they believe that he can make a great contribution to the improvement in this area with his innovations.

– PE "Post of Serbia" is a full member of the Universal Postal Union (UPU) and in the forthcoming period it can be expected that with intensive activities, monitoring, application and harmonization of valid world regulations and recommendations in the field of postal traffic, it will give its full contribution to the operation of Universal Postal Union. I hope that my project will find its place in all of this – concluded Vranić.

Prepared by: Vera Rakić

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