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As an introduction

Dear Readers, dear Friends,

We look back on several months of circumstances that our generation has never experienced before. The coronavirus pandemic marks a challenge for the global economy, including the public transport sector. In spite of those difficult days, we, as an industry, show that we are strong and that we can count on each other. Thanks to joint efforts, public transport keeps operating in most places in Europe, even if with numerous limitations.

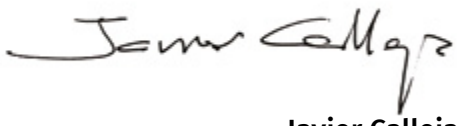
In Solaris we feel part of a greater, important whole. That is precisely why Solaris continuously does its work so that others may do theirs. By the effort of our whole staff we have reorganised operations in such a manner as to protect the health of our employees first, while concurrently also maintain continuity of business and relations with clients and suppliers. Our employees have shown profound understanding for these measures, for which I am extremely grateful.

We seek to keep the promise given to our clients – by implementing contracts, supplies and maintenance services. The début of the new electric model, the Solaris Urbino 15 LE electric, has been relocated to virtual reality, so that we may share our achievement with You, at least in this way. You can read about it in this edition of the Solaris Magazine. We recount the latest commissions on the pages of our magazine, but also what the "new normal" looks like at our firm. We inform about new safety-enhancing solutions introduced by us for public transport.

We are all still facing the challenges related to the consequences of the pandemic. However, I rest assured that we will overcome this difficult time and that we will be able to continue on the development path we have pursued so far. What is more, I truly believe that we will emerge stronger from this experience.

I wish you persistence and faith in the improvement of the current situation. I cordially reciprocate all expressions of support we have received from various parties. Let us take care of ourselves and our next of kin, let us keep safety precautions.

Happy reading and best regards to all of you,



Javier Calleja
CEO of Solaris Bus & Coach

Support for public transport needed

› The impact of the COVID-19 pandemic in Europe on public transport has been tremendous. Solaris is amongst the signatories of an open letter addressed to the highest representatives of EU institutions urging EU authorities to include the sector in the Recovery Plan for Europe.

The public transport industry has severely suffered, and is still doing so, from the repercussions of the coronavirus pandemic running rampant around the world. The representatives of the sector have asked for a helping hand of European Union authorities. In an open letter they request to have public transport included in the Recovery Plan for Europe, as it constitutes an industry of strategic importance for European economy and one of key importance for meeting sustainable development goals. The Recovery Plan for Europe is intended to mitigate the economic and social consequences of the coronavirus and to ensure sustainable development of the Old Continent. The letter addressed to the European Commission, the European Council and the European Parliament was signed by 89 signatories – namely automobile manufacturers, public transport authorities and public transport operators – including by Javier Calleja, CEO of Solaris Bus & Coach.

Solaris on the road **towards electricity**

› A project titled “EVolution Road” (electric road) was launched mid-2020 in the Swedish city of Lund. One of the project partners is Sverige AB, the representative of the company Solaris Bus & Coach in Sweden. The project aims at designing a road that will automatically detect and charge electric vehicles.

The first vehicle to be tested is a specially adapted Solaris Trollino. Solaris is responsible for the actual conversion of the bus and the exchange of the software from that needed for roof-mounted charging technology to technology for a pick-up device under the vehicle.

fot. EVolution Road

“Electric Road” uses wireless communication to identify electric vehicles approaching and switches on power in very short segments of one meter. The vehicles can be charged both while driving as well as at a standstill. The power can only be supplied in those areas where the pick-up receivers are able to connect with the rail. In all other segments in front of and behind the moving vehicles, the power will be turned off. Thanks to that, the part that is live, is always covered with the vehicle itself. This ensures safety and will ultimately allow for installing this charging mode also in cities (more information in the autumn issue of Solaris Magazine 2/2019, page 38-39).

The Netherlands bets **on hydrogen**

› Representatives of Solaris and the operator Connexxion providing transport services for South Holland province have signed a contract for the delivery of 20 Solaris Urbino 12 hydrogen buses.

South Holland is the most populous province of the Netherlands located in its western part. Twenty hydrogen Solaris buses will be delivered to that destination by the end of 2021. Concurrently to the bus sales contract, the parties have signed a servicing agreement for 12 years.

Refuelling of the hydrogen buses will be possible in the city of Heinenoord, in the vicinity of the bus depot, where private passenger cars, too, will be able to use the hydrogen refuelling station. Hydrogen refuelling takes little time and is quite convenient, not differing much in essence from the refilling of a vehicle tank with conventional fuels.

Hydrogen buses made by Solaris are thus winning further clients. Last year, an order for 12 vehicles of that type was placed by Italian operator SASA Bolzano, while in March this year German operators WSW Mobil GmbH from Wuppertal and RVK from Cologne ordered a total of 25 hydrogen Solaris buses.

Solaris with UBSI chosen again in Israel

› Solaris landed a substantial order – for 120 city buses of the Urbino 18 type. These buses will be handed over to the transport company Egged and they will be used for public transport in Jerusalem.

The 120 Urbino 18 buses are low-floor articulated vehicles of the MEGA class. The modern city buses will be fitted with engines meeting the Euro 6 standard. The first deliveries will start at the beginning of December this year, the final ones are slated for the turn of April and May 2021.

The buses were commissioned directly through the UBSI Nazareth, part of the Afifi Group. Solaris has co-operated with this local distributor since 2012. During this time, both companies performed the deliveries of nearly 500 Solaris Urbino buses to Israel. The Urbino buses can be seen among others on the streets of Jerusalem, Tel Aviv and Ben-Gurion Airport. The end-customer of the latest order for 120 articulated Solaris buses is Egged, one of the biggest carriers in Israel, handling both intercity and urban transport. Once the newly placed order is completed, the total number of buses supplied to Israel by Solaris will exceed 600 vehicles.

Début of articulated **e-buses in Romania**

› At the beginning of this year the city authorities of Craiova in Romania ordered 16 Urbino 18 electric buses made by Solaris. Owing to that investment the air quality in the city and the life comfort of the city residents will improve.

16 articulated e-buses will hit the streets of the Romanian city of Craiova in the first half of 2021. The first battery buses in the city will be recharged by means of pantograph chargers and plug-in charging devices in the bus depot. The infrastructure to recharge Solaris High Energy batteries will be supplied by Solaris, too.

Air-conditioned Solaris buses will offer WiFi access and a few USB charging ports where travellers will be able to recharge their mobile devices. A passenger information system and a video surveillance system will also be installed on board of each bus. The driveline will encompass a central motor.

The first investment of the city in battery buses with a value of circa EUR 12 million will be largely co-financed by the EU.

Poland is **European e-mobility leader**

› In the past months Solaris has signed many significant contracts for the delivery of modern electric buses to Polish cities. The biggest contracts were concluded with Lublin, Cracow, Poznań and Katowice. It is worth noting in particular that many of these cities have benefited from Urbino buses for many years now. Thus, decisions to purchase new vehicles were spurred by the direct experience in operation of these vehicles.

At the beginning of May the public transport operator ZTM in Lublin commissioned the bus maker from Bolechowo to manufacture another 12 Solaris Urbino 12 electric buses, that would join the 15 articulated Trollino trolleybuses and 20 e-buses of 12 metres ordered last year. Moreover, the Cracow operator MPK Kraków, too, decided in favour of more electric vehicles, namely 50 Urbino 18 electric buses. The articulated buses will join the fleet of 26 Urbino electric that have been already deployed in Cracow, painted in the colours of the municipal public transport operator. Soon, e-buses made by the producer Solaris will make it also to Poznań, whose residents have been benefiting from 21 comfortable Solaris e-buses for a few months now. The capital of the Greater Poland province has ordered another 37 new electric vehicles. 31 of these them are Urbino 12 electric buses, whereas 6 are articulated buses of 18 metres. More electric Solaris buses will also travel to Katowice. Representatives of the municipal operator PKM signed in June a contract for the delivery of 5 Urbino 12 electric. Following the completion of the latest order 15 modern e-buses in total will be cruising the streets of the capital of the Silesian Voivodship.

CNG buses already deployed **in Gävle**

› Solaris Sweden signed in March 2019 a contract with carrier Vy Buss AB for the delivery of low- and zero-emission vehicles. In June, the Swedish bus company put 40 new Solaris Urbino CNG buses into service in Gävle.

This Swedish town located at the Gulf of Bothnia was supplied with 24 Solaris Urbino 12 CNG (compressed natural gas) and 16 articulated Solaris Urbino 18 CNG buses. Running on compressed natural gas, the buses meet the rigorous European Euro 6 emission standard. They are propelled with the locally generated biogas.

The bus maker will deliver to Vy Buss AB another eight emission-free Solaris Urbino 12 electric in the last quarter of 2021 with a plan to put them into operation in January 2022. They, too, will make their rounds in Gävle.

The cooperation between Solaris and Swedish operators dates back to 2003. Since then, Solaris has supplied customers in Sweden with over 650 vehicles the vast majority of which are low- or emission-free vehicles.

Solaris awarded **in Smart City 2020 Competition**

› Solaris Bus & Coach won an award in the eleventh edition of the Smart City contest in the category Smart City Solution for "innovative solutions regarding e-mobility for zero-emission transport".

The aim of the competition is to disseminate the idea of building smart cities in Poland. The distinctions are given out to representatives of business and of local governments whose innovative projects contribute to the growth of the competitiveness of Polish cities and of the economy as such.

Solaris is the ideal partner for transitioning towards zero-emission public transport in Polish cities. By using innovative solutions and modern engineering concepts the company successfully introduces zero-emission vehicles on a large scale to public transport, thus having a real impact on the reduction of emissions in cities. In this respect, one of the maintenance service solutions, i. e. eSConnect – a system for the bus fleet monitoring and management of Solaris' design (more about eSConnect on page 20) has merited particular appreciation of the jury.

The nominees in other categories included cities with whom Solaris has had the benefit of cooperating for many years now, for example Poznań, Lublin and Tricity (Gdańsk, Gdynia, Sopot). At the same time, more and more carriers join the list of clients who choose environmentally friendly solutions for their conurbations.

We keep our word

The world premiere of Solaris Urbino 15 LE electric

On October 20, 2020 at 12:00, the premiere of an electric novelty from Solaris – a 15-meter battery bus – takes place. For the first time in the company's history, it is a virtual premiere with a unique interactive formula. The company's management and vehicle designers talk about the newest electric model.

"We keep our word" – that is the slogan for the event. The manufacturer had announced the unveiling of the Urbino 15 LE electric at the beginning of the year, before the outbreak of the coronavirus pandemic in Europe.

Despite the difficult times and unexpected challenges, Solaris keeps its word and introduces its latest electric vehicle to the market, at the same time opening a new - intercity – chapter in its emission-free offer.

Since meetings – with customers, suppliers, media, friends – are not possible now, the firm has decided to transition to virtual reality instead and to use this space to present its battery novelty. Solaris keeps its word, because it consistently walks the path set out many years ago, towards electric drives. Solaris keeps its word, because in spite of how difficult the situation is, it never ceased to manufacture ecological buses, knowing full well that these are what clients and passengers need.

The online premiere of the Urbino 15 LE electric is available at

www.solarisbus.com/premiere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Urbino 15 LE electric
SOLARIS

Urbino electric
ventures out of town

The tri-axle bus is yet another stage in the advancement of Solaris for whom the electrically propelled vehicles are the apple of its eye. The Urbino 15 LE electric is the first item in the electric portfolio of Solaris to venture beyond city limits – the vehicle meets requirements of both the first and the second vehicle class, and of both categories at the same time, which makes it possible for operators to plan zero-emission routes not only within the city confines but also beyond these. This bus is an excellent, environmentally friendly alternative for diesel buses currently used in that segment. That is precisely why the première of the vehicle is such a landmark for Solaris and for the industry in the transitioning towards zero-emission transport.

The heart of the Urbino 15 LE electric is a central motor of 300 kW. To boost efficiency and to reduce energy consumption even further, the propulsion was made in the innovative SIC technology, i.e. by using silicon carbide-based circuits. The motor is liquid-cooled, whereas the driving power is transmitted to the second axle of the vehicle. Energy derived from a set of 6 batteries, with a total capacity of 470 kWh, is fed into the propulsion system. 4 packs have been installed in the rear of the bus, the remaining two have been mounted on the roof. The latest generation Solaris High Energy+ batteries offer ranges of up to a few hundred kilometres on a single charge. Thanks to these, the Urbino 15 LE electric will cover a distance of up 250 km on a single charging session in real-life conditions. This bus is the answer to expectations of municipal carriers, as well as intercity transport operators.

The batteries in the new model can be recharged in fast mode, using a pantograph – both a conventional, roof-mounted one, as well as an inverted one, lowered onto the bus roof at the charging station. Moreover, each model of the tri-axle electric bus is fitted with a plug-in connector for recharging vehicles mostly at night, on the premises of a bus depot. For the convenience of the clients, the producer has devised four options of placing the charging plug-in in a bus: it may be placed above the first axle in the left or right part of the vehicle, in the front of it or in its back.

The newly released model features an air conditioning system with a heat pump function, which uses heat drawn in from outside to reach the right vehicle temperature. This solution allows to raise the energy efficiency of the vehicle, which translates directly to a widened driving range. The device uses carbon dioxide as the working fluid.

The Urbino 15 LE electric guarantees comfortable travel conditions not only due to the quiet and smooth operation of the motor, reduced vibrations and the lack of any exhaust gasses whatsoever. The air-conditioned interior of the showcased bus holds 53 seats which offer a relaxing and pleasant ride. There are two additional folding seats. What is more, three seats in the novel vehicle are fitted with ISOFIX – i.e. a system that enables the securing of a child seat. Passengers with children will surely appreciate this save and practical solution. It is worth recalling that in the two-door version the Urbino 15 LE electric can hold up to 65 proper seats.

The Urbino 15 LE electric:

- emission-free transport both in the city and on intercity routes
- the largest number of seats in Urbino family in this class
- great flexibility with regard to bus equipment and charging infrastructure
- maximum safety and comfort for driver and passengers

The infrastructure of the vehicle has been designed in line with ITxPT standards. Three large screens created by Solaris engineers shall ensure legible information for passengers. What is more, the Urbino 15 LE electric is fully adapted to be integrated with the company's own remote fleet management system, dubbed eSConnect, which ensures full telemetry, data analysis and the servicing of defects that have already appeared, as well as those that might emerge in the near future.

The new interactive driver's panel with touch screens combines many advanced security functions. Starting with warnings advising the fastening of seatbelts, automatically switched on lights and windscreen wipers, wide-angle cameras in lieu of rear-view mirrors that ensure excellent visibility, and ending with the active driver assistance system Mobileye Shield+. These innovative solutions render the problem of so-called blind spots void for all times. What is more, the Mobileye Shield+ notably lowers the risk of direct collisions with pedestrians and vehicles, by detecting their presence around the vehicle and notifying the driver about them using audio and visual alerts.

The first two Solaris Urbino 15 LE electric were made chiefly with Scandinavian operators in mind. That is also why the presented bus will feature special solutions in compliance with Busnordic norms and the so-called Scandinavian package. Bearing in mind the tough climate conditions, the designers made sure that both thermal and travel comfort are ensured during rides. Vehicles of this type may contain other components that facilitate their operation in difficult conditions – for instance additional high beams, a sanding device or a cache for snow chains.

Solaris has vast experience with regard to the production of 15-metre tri-axle buses; so far, the manufacturer has already delivered nearly 1300 vehicles of that type to customers. The première Urbino 15 LE electric is the first model crafted on the basis of solutions already applied in new generation vehicles. Crucially, this is a new product which, for the first time in the company's history, was designed solely for the purpose of zero-emission drivelines.

URBINO 15 LE ELECTRIC

Full electric 3 axle bus

Technical details:	
Class	II class (I class as an option)
Dimensions	L: 14 890 mm W: 2550 mm H: 3400 mm
	Front overhang: 2750
	Wheelbase: 7000/1690
	Rear overhang: 3450mm
VGW	up to 25 t
Doors	2-2-0, 2-2-1, 1-2-0, 1-2-1
Central traction motor	ZF CeTrax 300 kW, cooling: liquid
	SiC technology in driveline area
Batteries	Solaris High Energy+, 6 packs – 470 kWh
Axles	front RL82EC
	drive AV 133
	tag RL82A
Wheels	295/80 R22,5 (275/70 R22,5 as an option – height 3360 mm)
	Minimum turning radius ~ 14,6 m
Passenger capacity	up to 90 people
Seats	CLASS II – Up to 65 seats, 6 seats available directly from the floor
	CLASS I (option) – Up to 61 seats 6 seats available directly from the floor
AC	air conditioning + hybrid heating (standard)
	air conditioning with CO_2 heat pump heating function


SOLARIS

Safe public transport in epidemic times

Public transport has always been and remains one of the safest, most efficient and most ecological modes of travel for people in cities. The past months and the coronavirus epidemic in Europe and around the world have given rise to many new challenges, also transport-wise. As a reply to this situation, Solaris has worked out a special set of solutions raising the safety of passengers and drivers in a bus. Importantly, these can be applied both to vehicles already delivered to clients as well as those yet to be commissioned and manufactured.

Over 19 thousand Solaris vehicles operating each day in 32 countries and 750 cities. To make the travel on those safer and comfortable also during the pandemic, Solaris has drafted up and implemented new solutions whose purpose is to minimise the risk of infection for passengers and drivers.

All of the solutions proposed by us have been already perfected and tested in real-life urban conditions. Of course, since there are many various models of our vehicles, each and every question of our clients will be analysed individually, in terms of technical possibilities. The Service Customer Account Manager is the source of information about these matters on all the markets to which we deliver products. We are more than happy to provide advice regarding the best solutions for our clients and support to ensure that it becomes even safer to ride on our buses and trolleybuses.

Petros Spinaris,
Deputy CEO in charge of Sales, Marketing and Customer Service

Solaris has also drafted detailed recommendations for its clients, regarding the use and maintenance of ventilation and air-conditioning in buses. These concern among others the frequency and mode of washing and of disinfecting the air-conditioning or the exchange of filters and their types. Thanks to these instructions, it is possible to improve upon the safety of passengers and to limit the risk of spreading infections in the bus to a minimum.

The propositions regarding the antiviral measures of Solaris help to minimise the risk of contracting the disease. They make the public transport vehicles safer also throughout the epidemic. One could venture to assert that thanks to the above solutions, the buses are even safer than many other closed public or private venues where none such precautionary measures are implemented. Together with our clients who are managers and operators of public transport, we offer, to the passengers, solutions that guarantee comfort and travel security in cities, even in those exceptional times we have to face. I am greatly impressed by how wonderfully our clients brave the current challenges, and how passengers using public transport do so in a safe and responsible manner.

Javier Calleja,
CEO of Solaris

Starting from the bus entrance, Solaris offers the following solutions:

Hands-free opening and closing of doors for passengers

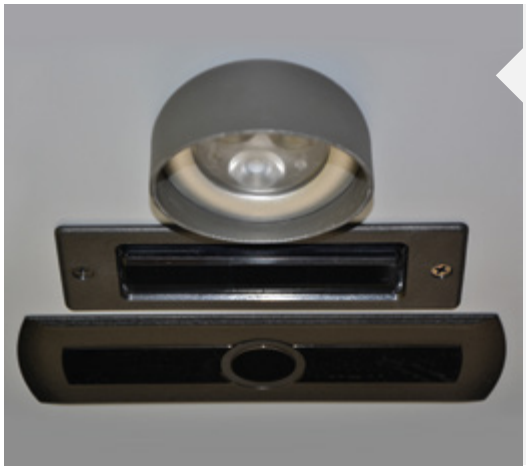
– this amenity is based on through-beam sensors detecting people who want to either get on or off the bus. Operating from their panel, the drivers permit the opening or closing of the doors which will respond automatically, without the need for passengers to press a stop button.

Disinfectors

– it is possible to attach hand disinfectant dispensers to the rails inside of the bus. After one refill, the disinfector can perform 3000 operations, while being easy to handle and consuming little energy. There can be several such devices installed in one vehicle, depending on the interior layout.

Intercom

– a non-contact passenger-driver communication system – in order to limit direct contact between drivers and passengers to a minimum, buses can be also fitted with a so-called intercom, namely a device for voice communication between passengers and the driver. Thanks to that system, it is possible to comply with social distancing rules even when talking to the driver.



Passenger counting system

– during the epidemic, in many countries the operators were forced to limit the number of passengers allowed to travel at a time on a public transport vehicle. In order to inform both drivers and passengers as to the number of passengers currently onboard of the bus, and how many more passengers may still embark it, the carrier may opt for a passenger counting device. The system is located near the vehicle door and it automatically collects data on the number of travellers, registering each bus entry and exit in the process. Information about the current number passengers may be displayed both on the driver's panel, as well as the external or internal notice boards.

Closed driver's cabins

– in consideration of the day-long labour of drivers, Solaris has devised a closed cabin version, in order to set up comfortable and safe work conditions. The cabins provide separate air-conditioning and ventilation systems to drivers; these devices minimise the possibility of circulation of air within the passenger compartment. The driver may have a separate entry / exit at their disposal which allows to minimise direct contact with other travellers.

You can learn more about antiviral and antibacterial solutions provided by Solaris at:
www.solarisbus.com/en/after-sales/antiviral

In 5 minutes

**Interview with Henrik Falk,
CEO of Hamburger Hochbahn AG**

Hamburg has recently announced the suppliers of up to 530 electric buses to the city. One of the three selected firms is Solaris. We talk to Henrik Falk, CEO of Hamburger Hochbahn, about the transition towards zero-emission drivelines, managing a large fleet of electric buses and how much 5 minutes will be for residents of Hamburg.

Solaris: Many cities have begun exchanging their bus fleets for zero-emission vehicles. However, no-one in Europe has ever bought 530 electric buses in one go. Why does Hamburger Hochbahn want to be first?

Henrik Falk: It is indeed a large order and a milestone in the transformation of our fleet to emission-free drives. Commissioned by us following a public tender, the purchase of up to 530 buses has been staggered over a period of five years. This scale reflects also the number of vehicles we need to replace the decommissioned buses with conventional drives and to implement the transport options which we intend to widen constantly. From this year on we will buy only zero-emission buses. This follows from the resolution of the Free and Hanseatic City of Hamburg which is to allow reaching climate policy targets. We intend to exchange our whole fleet for zero-emission vehicles by 2030. For the moment being, it amounts to over 1000 buses.

S: How do you prepare for the operational launch – and the subsequent use as such – of such a huge electric fleet?

HF: The transformation will require the involvement of all segments of HOCHBAHN. The bus depots need a full overhaul. The bus depot management system (BMS) will be upgraded and adjusted to the needs of electric vehicles (E-BMS). What will be necessary, too, is the change of equipment of workshops and the preparation of work stations for roof works, so that technicians are given access to the vehicle installation during maintenance.

S: The Innovative Line 109 sets new trends for operators in all of Europe. What advice do you yourself have for other operators who only now are entering the path of electrification of their fleets?

HF: The launch of the Innovative Line was an important step because it enabled both us and the producers to raise a lot of experience. For the first time in Europe, various technologies were tested in identical conditions and compared to each other: hybrid buses with an electric and a diesel engine, plug-in hybrids, electric vehicles, those with a fuel cell and electric buses with a fuel cell as range extender. The joint initiative of Hamburg and Berlin for the mutual further

fot. Hochbahn Hamburg

development and standardisation was just as important. In particular, we are working on standardization of charging technology. In the meantime, other transport businesses from nearly 20 cities that wished to share their experience, have joined the venture. It seems to me that it is important to have all cities accrue their experience, taking into account their own specific features - that is the right approach. The exchange of experience will allow us to benefit from tried and tested solutions that will help avoid errors in the future.

S: The industry continues wondering what to choose: hydrogen or batteries? What is your opinion on this matter?

HF: In order to switch fleets to zero-emission drives, we need both technologies. The battery technology certainly has one advantage. There are already vehicles on the market set for serial production, which cannot be said of hydrogen vehicles just yet. However, one can occasionally see buses with fuel cells ready for serial production. These, however, have to turn up in the end because we need that technology for longer ranges. In this case, the batteries are clearly reaching their limits. Another advantage of hydrogen is the bigger flexibility it offers, for instance a shorter refuelling time compared to the recharging of batteries. So far, we have held a tender for the first 50 buses with a fuel cell. They are to be delivered to Hamburg in the years 2021-2025. These will be both typical buses with fuel cells as well as electric vehicles with a fuel cell acting as range extender.

S: How can cities encourage inhabitants to use public transport?

HF: In Hamburg, we have set for ourselves very ambitious climate targets. In order to reach those, by 2030 we want to increase the share of routes serviced by public transport vehicles from 22% to 30%. These 8 percentage points represent a hike in the passenger number by 50 percent (sic!). In order to meet this challenge we have to considerably extend the underground network and the bus grid. However, that will not be enough. Our offer also has to be widened by new mobility services including shared mobility services, i.e. sharing the same transport service by even many users, which is coordinated using an application, the seeds of which in Hamburg - beginnings of which in Hamburg

already look very promising, thanks to the activity of the firms MOJA and JOKI. Our goal is to allow every citizen of Hamburg to arrive within 5 minutes to any kind of public transport vehicle of the wide range of mobility services offered by the city – on the complete city area and not only in city centre. This will render driving by one's own car across town pointless and quite simply – unappealing.

S: Many industries, including public transport, have been hit hard by the coronavirus pandemic. How did HH cope with that crisis?

HF: During the lockdown in Hamburg, the number of passengers travelling on public transport came to merely 30% of what was recorded in the same period a year before. Nonetheless, in consultation with our owner, i.e. the Free and Hanseatic City of Hamburg, we decided to fully maintain the existing bus timetable. This was necessary to allow people to comply with social distancing rules in a time when it had not been necessary to wear masks. And in the case of some bus lines where the overall number of passengers was higher than the average we have actually raised the number of offered rides. This has been greatly appreciated by travellers and it will certainly enhance their conviction that the transport service we offer is safe also in times of the coronavirus. What is more, after it was made mandatory to wear masks – failing which can now end in a fine – we have installed glass partitions between the work place of the driver and the passenger compartment in all buses. We have established mobile teams for hygiene. These were tasked with disinfecting high-touch surfaces in all buses at large interchange points. What is more, we have launched a pilot programme concerning the new metro interchange. In all 250 metro trains making up our fleet we have automated the mode of opening and closing the doors. Now, our trains open all doors at each stop, thus ensuring adequate airing of the train set. In the meantime, the number of passengers has risen to 75% of the figure recorded last year. In my opinion this is a really good result, taking into account that we still do not ride to many places – we travel less for recreational purposes, we work from home etc. In 2022 latest we should return to a pre-pandemic level.

Optiline parts:

their application during the warranty period

Cutting servicing costs as much as possible is the aim of, and a challenge for, every transport company, in particular during the warranty period of the vehicle. The Optiline spare parts line is our response to that, boasting not just a competitive price but, above all, supreme efficiency. Air bellows, brake pads, air conditioning and heating filters by Solaris Optiline can also be used during the vehicle warranty period due to their quality and effectiveness.

Reducing vehicle servicing costs is a goal shared by the whole market, even though every carrier is pursuing it in a different way. Unfortunately, the possibilities available to transport operators are often limited due to the narrow range of products on the market that are approved for use during the warranty period. So, what solution would allow one to optimise costs and keep the warranty valid at the same time? Well, strictly follow the recommendations of the vehicle manufacturer.

When it comes to maintenance parts, Solaris has extended the range of products that it approves and recommends for use during the warranty period of its vehicles. Among them are selected Optiline products that meet the highest quality and safety standards and are equivalent to those provided by parts manufacturers for first assembly.

Optiline brake pads

are a product that has already earned the trust of customers in markets Europe-wide. It is not only their price that has substantially contributed to the success of these components. Optiline brake pads report record mileages reaching 186,000 kilometres, and thus they prove that longer intervals between replacements are an additional, measurable benefit resulting from their use.

Optiline air bellows

Due to their high, proven efficiency, allow operators to reduce the frequency of replacements to intervals of even up to 900,000 kilometres. What is more, the progressive design of the air bellows protects the whole vehicle from mechanical damage, and consequently it allows costly repairs to be averted.

Air conditioning and heating filters

are particularly attractive due to their price at a time when more frequent replacement and servicing of air conditioning systems is recommended. Furthermore, the product guarantees 99.99% efficiency, which translates into thoroughly cleaned air for passengers to breathe. Today, in these difficult times with the pandemic, it is particularly important to ensure even more efficiently filtered, and thus cleaner air, in public transport vehicles.

The use of Optiline products during the warranty period can bring measurable benefits. This brand, designed by Solaris, above all guarantees an attractive price. Due to their high quality, the spare parts suffer also less wear and tear. Numerous clients from all across Europe, who have used Optiline products, are becoming more and more convinced of that fact.

Original spare parts
– a choice that pays off

In the servicing process, original spares are often replaced with generic ones. But how can one be certain that they will fulfil their task as well as OE parts? Recommendations by the vehicle manufacturer clearly indicate that a high-quality product is crucial for the vehicle to operate properly.

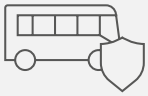
How can you make the best possible choice?

- If possible, opt for spares that are type-approved. A type-approval certificate is proof that a given part complies with all technical requirements set out in the provisions.
- When choosing spare parts, follow the instructions of the vehicle manufacturer. They are always based on specific design characteristics that determine the way a vehicle operates.
- Purchase spare parts from proven suppliers, well-known for their reliability and high-quality products. Only then can you be assured that you are using certified spare parts.
- When receiving a delivery, check it carefully. In the event of any doubt, contact the supplier and ask them about the specific characteristics of the original part.

Why is the use of original spare parts so important?

You can be certain that the warranty for the given component will not be rendered void. Remember that only the use of parts recommended by the vehicle manufacturer will later allow possible claims to be examined.

You will be choosing parts that have undergone stringent tests to ensure that their quality fulfils all applicable standards.



By choosing proven and reliable components, you contribute to improving road safety.

In the long term you reduce vehicle servicing costs. High quality spares, well-tailored to the design characteristics of the vehicle, exert a favourable impact on all other associated components reducing their wear and tear.

Solaris's product range includes parts recommended for use in vehicles from the Urbino and Trollino families. It is available at the **magbus.global** website or directly from local account managers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An electrically -powered way to school

The first electric school bus in Poland will carry children to classes in Godzianów near Łódź. The Urbino 12 electric will be orange, as befits a school bus. The ecological school bus will be supplied by Solaris to the commune of Godzianów in October this year. The commune of Bielany has also opted for a Urbino electric school bus.

"Kangaroo: A safe and environmentally friendly way to school" is a project of the NFOŚiGW (the National Fund for Environmental Protection and Water Management). A part of that project saw towns in Poland receive subsidies for the purchase of battery-powered school buses.

The electric school buses for the communes of Godzianów and Bielany will be manufactured by Solaris. These will be the first vehicles of this type in Poland. In October this year, the school bus Urbino electric will start to transport children to the school in Godzianów, and a month later another Urbino electric will bring pupils to school in the commune of Bielany.

The electric school buses ordered by both communes will boast similar parameters. There will be 41 seats on board of each bus for young passengers and all of them will feature safety belts. Notice boards informing about the transport of children will be placed on the front and rear panels of the orange electric school buses. What is more, orange beacon lights, turning on automatically when the bus doors open, will be mounted on the bus roof, in the rear section.

Thanks to having batteries, the vehicles will not release any pollutants into the atmosphere. The energy storage system of the electric school buses will consist of the new generation batteries Solaris High Energy+, with a total capacity of almost 240 kWh, and which warrant a drive range of at least 200 km in all road and weather conditions. An electric axle with two integrated electric motors will ensure a comfortable, smooth ride that is noise-free and without violent vibrations.

These are the first electric school buses that will roll out of the Bolechowo factory. Within the framework of the programme spearheaded by the NFOŚiGW, other Polish communes will receive funding, too. We may therefore expect further orders soon.

eSConnect

– growing opportunities of public transport

Those who want to be a leader on the dynamically changing public transport and e-mobility market have to act fast on their own accord. Today in order to lead one has to run – and run twice as fast as others. The eSConnect system, and its rising possibilities are the answer of Solaris to the development of zero-emission transport and the mounting requirements of clients and operators related to such transport.

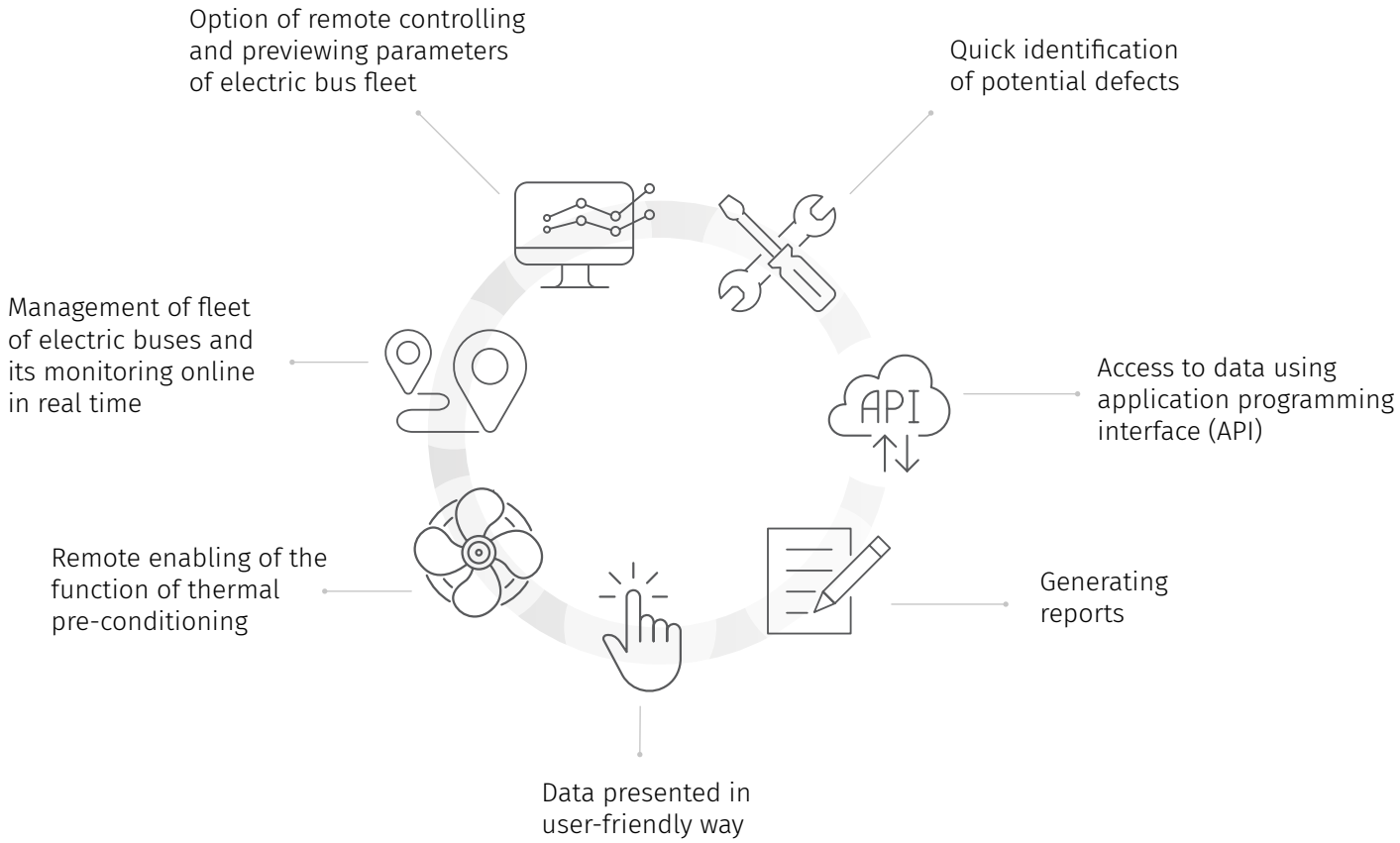
Created to monitor the bus fleet by customers and to increase the efficiency of servicing, the eSConnect system is a precise tool enabling the efficient management of an electric bus fleet and their optimal operation. All irregularities and errors are immediately identified and indicated by the vehicle on the driver's panel and notified to the operator. Solaris' service, too, has remote access to diagnostic data. Using the eSConnect system, service facilities in many cases are able to remotely diagnose a faulty component and prepare the service for repair, if required. This allows the carrier to avoid unnecessary rides in response to "false alarms" or defects that do not threaten the correct operation of the vehicle.

The base of real operational data, such as the number of charging cycles and the time needed to recharge batteries, allows to optimise the consumption of energy on the road, but also to accurately define the technical requirements for buses on particular routes. The data base in the making (so-called big data) is also enormously valuable for vehicle makers – it allows them to further perfect the solutions applied and to optimise the bus design and therefore to cap energy consumption even more.

The eSConnect can be expanded by adding additional functionalities, such as the remote enabling of the function of thermal pre-conditioning. Used during the bus charging process, pre-conditioning optimises the consumption of electric power during a ride, because the vehicle does not use the energy stored in traction batteries for heating or cooling. Coupling the eSConnect with that function enables the remote presetting of the date when pre-conditioning is to begin or end. The function can be defined separately for each individual bus. The scheduled launch can be monitored and, if necessary, modified. Thanks to this option, the bus manages to reach optimal operational parameters much faster after being started. Thermal pre-conditioning allows to widen the vehicle driving range on a single charge, which translates to savings for operators.

The fleet management and remote diagnostics system eSConnect constitutes an expansion of Solaris' existing offer of e-mobility solutions. It is tailored to those customers who have opted for the purchase of emission-free vehicles, and it can be installed in every newly produced electric bus as well as those already delivered on the market.

eSConnect – the response to new challenges



Valvoline Premium Blue One Solution 9200 – THE ONLY ONE

In the second half of 2019, Valvoline Europe introduced its first heavy-duty multi fueled engine oil – Valvoline Premium Blue One Solution 9200. It is a unique formulation, intended for use in both diesel engines and engines powered by LNG, CNG, LPG and propane gas, making this oil a truly universal product solution. It can reduce the cost of inventory by preventing you from keeping different oils for different types of engines covering a diverse range of vehicles. This allows you to reduce the cost of vehicle maintenance and minimizes the risk of using the wrong type of oil in an engine.

Valvoline has been an innovator since its birth in 1866 and today still leads the way in many market applications. Valvoline Premium Blue One Solution 9200 engine oil was developed together with Cummins and is dedicated to Cummins engines. Thanks to carefully selected top-quality base stocks, as well as a unique additive package has been approved by leading engine manufacturers. It has been formulated to work in some of the most demanding applications, has an excellent resistance to oxidation and offers class leading thermal stability. This oil provides an unparalleled degree of critical engine protection for engines running on different types of fuel. To cover the various industry requirements the product is available in two engine oil viscosities either SAE 10W-30 or 15W-40.

The operating conditions of engines powered by CNG or LNG gas differ significantly from the operating conditions of engines powered by conventional fuel (diesel or gasoline). The main difference being that the combustion process of the CNG/LNG fuel mixture is different to diesel – e.g. higher temperatures and a more challenging combustion process.

The higher temperatures can affect critical engine components such as valves, spark plugs and piston crowns and form contaminants such as strong acids that can degrade the oil and increase deposit formation. Ash deposits in CNG engines can also result in issues with combustion pre-detonation, but Valvoline Premium Blue One Solution 9200 has a special balance of detergents that minimizes these issues.

The oil formulation must also be kind to the exhaust emission after-treatment systems and hence needs to contain a lower balanced amount of phosphorus, phosphorus has been used to great success in the past in anti-wear chemistry designed to protect the engine as it improved the properties of engine oils. These new low-emission gaseous fueled engines are equipped with three-way catalytic reactors, get the phosphorus content wrong

in the oil formulation and it will contribute to the reduced service life of the catalysts and may even poison the system increasing tail-pipe emissions. This product has a new class leading additive technology designed to protect the engine whilst working in harmony with the emission systems.

The challenges detailed above for mixed fleets led the Valvoline engineers to find a solution and then go on to prepare a special unique formulation in the form of Valvoline Premium Blue One Solution 9200. As the name suggests this product provides protection for multi fueled engines, offers excellent resistance to oxidation as well as offering excellent TBN retention, making it ideal for tough duty cycles that require extended periods of service life in all fuel types. In addition, this oil is characterized by offering the highest degree of engine component protection, keeping key components clean for long periods of time.

Valvoline Premium Blue One Solution 9200 engine oil was the first Cummins CES 20092 oil to be approved and is the ONLY ONE product officially endorsed and recommended by Cummins for gas powered engines requiring a CES 20092 specification. It also carries the latest API CK-4 and Cummins CES 20086 diesel specifications and API SN Gasoline specification making it suitable for many engine types. It covers the latest EURO 6 emission norms and is backwards compatible for older vehicles with or without after treatment systems.

Valvoline Premium Blue One Solution 9200 also offers additional performance specifications from some of the other key heavy-duty engine manufacturers such as Volvo, Renault, Mack and Detroit Diesel, so it can be used used in large mixed fleets.

Valvoline™

New normal,
or more in tune, flexible, ready for changes

No-one could have predicted such a scenario for 2020. The pandemic, which Europe has been facing since the first days of March, turned out to be an exceedingly difficult experience, and one our generation is completely unaccustomed to. Combining the efforts of the whole team, Solaris is trying to respond to this new challenge and to manage in such a way as to protect the health of employees while maintaining the continuity of actions and relations with clients and suppliers at the same time. What is more, the firm has managed to use many of these valuable lessons in many aspects of its business, adapting it as best as possible to the new normality and to prepare it for changes yet to come.

European public transport has been feeling acutely the consequences of the coronavirus pandemic right from its start. It is an extremely important segment of the economy – one that satisfies crucial social needs and enables residents to move around. In many places it is special public transport lines that allow healthcare workers to reach hospitals. Luckily, thanks to the joint efforts of the whole industry – city carriers and drivers, mechanics, maintenance operatives, as well as producers and suppliers – public transport still works efficiently, even if it is subject to some restrictions, in most places across Europe. For that very reason, as a part of a greater, important whole, Solaris continues its business operations without interruptions. The firm keeps performing contractual obligations, deliveries and maintenance services, while at the same time ensuring employment and financial security for its staff. Solaris does its work so that others may do theirs.

In spite of difficulties continuing for many months, the tight-knit team of workers managed to not only settle into the new reality, but to also work out innovative, effective improvements and solutions.

All company events, meetings and conferences were cancelled. In order to avoid health risks for employees, the company introduced a myriad of preventive measures. Every person setting their foot on company premises is subjected to mandatory body temperature measuring. It is absolutely mandatory to wear protective masks and gloves in all buildings of the company. Disinfectant dispensers have been set up in many places, and devices in shared employee spaces are additionally disinfected. What is more, company buildings are more frequently cleaned and aired. The work organisation of all Solaris staffers was changed so as to ensure that social distance is kept between work stations. The team has shown exceeding diligence, loyalty and commitment in this respect.

Flexibility has turned out to be of key importance in the new lockdown reality. How should one hold trainings abroad when... all the borders are closed? How should one maintain production continuity when dozens of employees have to stay away from work? How can one prepare IT infrastructure for the remote work of hundreds of people in the course of one weekend? New ideas in many areas have emerged which have helped perform tasks in the new circumstances – in fact which often helped improve that work. The company managed to successfully and very efficiently perform an external remote audit. A completely new inter-departmental team assembled prototype substitute components that ensured continuity of production. When the crew temporarily shrank by dozens of people, the company swiftly reorganised work, meaning that many employees gained experience in areas that were completely new to them and so they complemented the capacities of provisionally slimmed down teams.

From one day to the other, hundreds of employees had to move their workplace to private premises and to work from home. Having fewer

employees in the plant means more security for those who continue working there. Incidentally, in both groups there were many people who also had to cope with closed nurseries, kindergartens or schools – the daily routine of many a family was turned upside down. Working, focusing and keeping silence when at home requires a particular "workout" routine – one has to be a nanny, teacher, cook and efficient worker all in one and at the same time. In spite of the obvious longing for a regular desk, for co-workers and peace of mind – because there is no need to escape to another room when our other half holds an important phone call at the same time, and there are no heads of children, cats or wedding pictures appearing in the frame during a video-conference – many employees admitted that, the inability to hold conventional meetings did, paradoxically, increase the frequency and efficiency of these meetings.

Even though the whole industry is still facing many difficulties and challenges, Solaris has great confidence in the future, whereas the wonderful, tight-knit crew makes a great effort to get through this difficult time unscathed and to continue on the successful path of development taken until now. Undoubtedly, many of the experiences gained in the past months will result, in the future, in good habits, inter-departmental cooperation and more attentiveness and responsibility for oneself and others every day.

SOLARIS
A CAF GROUP COMPANY

DIRECTION ›
Optiline

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Designed by those who brought your bus to life.

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