

persönlich

The Swiss communication magazine for decision makers and opinion leaders

Special issue | December 2019



ABB Formula E A Revolution in Racing

Anne Hidalgo: Paris is ready · Porsche Taycan: electric turbo boost · Lord Norman Foster: smart urban planning · Michel Vaillant: also top in FE · Trondheim: a breath of city air · The seven wonders of the sustainable world

Matthias Ackeret

The green, real-world acid test




Matthias Ackeret is the publisher of "persönlich".

Brussels, mid-October: representatives of ABB and its lead agency Serviceplan Suisse attended the prestigious Euro Effie Awards Gala, where ABB became the first industrial company to be recognized in the Brand Experience category, one of the most important marketing communications prizes. The jury cited the company's exemplary role as title partner in the global ABB FIA Formula E Championship as the reason for its decision. It was, of course, an excellent choice. The electric car races aren't just a pioneering venture – they also provide irrefutable evidence that eco-friendly technology can rival the competition. Long before Greta, ABB Formula E demonstrated commitment to a more climate-friendly lifestyle and – perhaps even more importantly – showed that lifestyle was more than just an irrational dream and that it could exist in practice.

This issue of "persönlich" highlights the revolutionary nature of ABB Formula E. The global electric car championship doesn't just appeal to tech heads and race fans – tens of thousands of people flock to watch the races live in major cities around the world. The Championship certainly drew in the crowds when it came to Zurich and, last year, to Bern. The fact that there were protests, ironically led by environmental campaigners, left a bit of a sour taste and also showed that there's often a big gap to bridge between theory and practice. But that hasn't hindered the Championship at all: in fact, Porsche and Mercedes will be joining the lineup for season six next year.

In Switzerland, we should feel very proud of the fact that ABB, a Swiss-Swedish industrial pioneer headquartered in Zurich, is the world's leading provider of industrial electric motors, generators and drive systems. ABB Formula E is an important testing ground for a new generation of cars that are not just electric but also sustainable and eco-friendly. Remarkably, electric motors now consume almost a third of the world's electricity, and that figure is rising. Or as Virginia Raggi, Mayor of Rome, aptly states in our special issue: "The future of private mobility is electric. Thanks to technology, we are able to imagine a simpler future for those who opt to switch to electricity."

At "persönlich", we are delighted to be able to provide a little insight into the field in this special issue of the magazine, created in collaboration with ABB and its lead agency Serviceplan Suisse. We would like to thank Dr. Nicolas Ziegler, Head of Markets, Brand and Events ABB, Christian Baertschi, CEO Serviceplan Group Switzerland, Nicolas Gspan, Consultant at Serviceplan Suisse, and their colleagues for making it possible. We hope you enjoy reading this special issue, and we hope that it inspires interesting discussions. 

Jean Todt


E-racing: Driving access to affordable, clean and safe transport

The FIA is best known for overseeing the world's greatest motorsport events, but ever since its founding in 1904, its main mission has been to promote the adoption of new automotive technology and to represent the interests of drivers. At its core, the FIA is dedicated to ensuring safe, sustainable and accessible mobility for all road users across the globe – a goal that is especially close to my heart as FIA President and as the United Nations' Secretary General's Special Envoy for Road Safety. The FIA's commitment to sustainable mobility is powerful and deep-rooted, and that is why we believe in the importance of the ABB FIA Formula E Championship.

Mobility connects people and nations, drives the economy, and in turn is driven by technological innovation. The ABB FIA Formula E series is now in its sixth season and continues to push the boundaries of all-electric power, speed, endurance and safety. Like all FIA series, ABB Formula E competes to develop new technologies for the racetrack. These ultimately find their way into cars, buses and trucks, generating significant added value for all road users.

The final result will be a world in which people can travel cleanly, efficiently, affordably, safely and conveniently, to anywhere the road will take them. Electric mobility is poised to reduce travel costs, cut vehicle lifecycle emissions, and dramatically improve the quality of air in our cities as well as lower vehicle emissions.

Concerns about public health and vehicle noise have motivated many of the world's great cities to seek out new transport solutions. As it happens, ABB Formula E is just about as clean and quiet as any motorsport could be, which makes it possible to hold races on the streets of some of the world's most iconic cities. Those that host this series share our vision for a future dominated by electric mobility.

ABB's clear understanding of our mission and message makes it the ideal title partner for the ABB FIA Formula E Championship. With its advanced portfolio of solutions for e-mobility, ABB is just as driven as we are to promote the benefits of electric vehicles and the excitement of all-electric racing. We are very pleased to be working with them and are looking forward to all the thrills the new season is sure to bring. 



Jean Todt is President of the FIA.



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This is a special issue of “persönlich”.

We would like to thank everyone at ABB Asea Brown Boveri Ltd, with whom it was a pleasure to work.



ABB (ABBN: SIX Swiss Ex) is a technology leader that is driving the digital transformation of industries. With a history of innovation spanning more than 130 years, ABB has four customer-focused, globally leading businesses: Electrification, Industrial Automation, Motion, and Robotics & Discrete Automation, supported by the ABB Ability™ digital platform. ABB's Power Grids business will be divested to Hitachi in 2020. ABB operates in more than 100 countries with about 147,000 employees. www.abb.com



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Presidents of the ABB businesses

What do you expect from ABB Formula E?

ABB is a technology leader that is driving the digital transformation of industries through five businesses: Electrification, Industrial Automation, Motion, Robotics & Discrete Automation, and Power Grids.

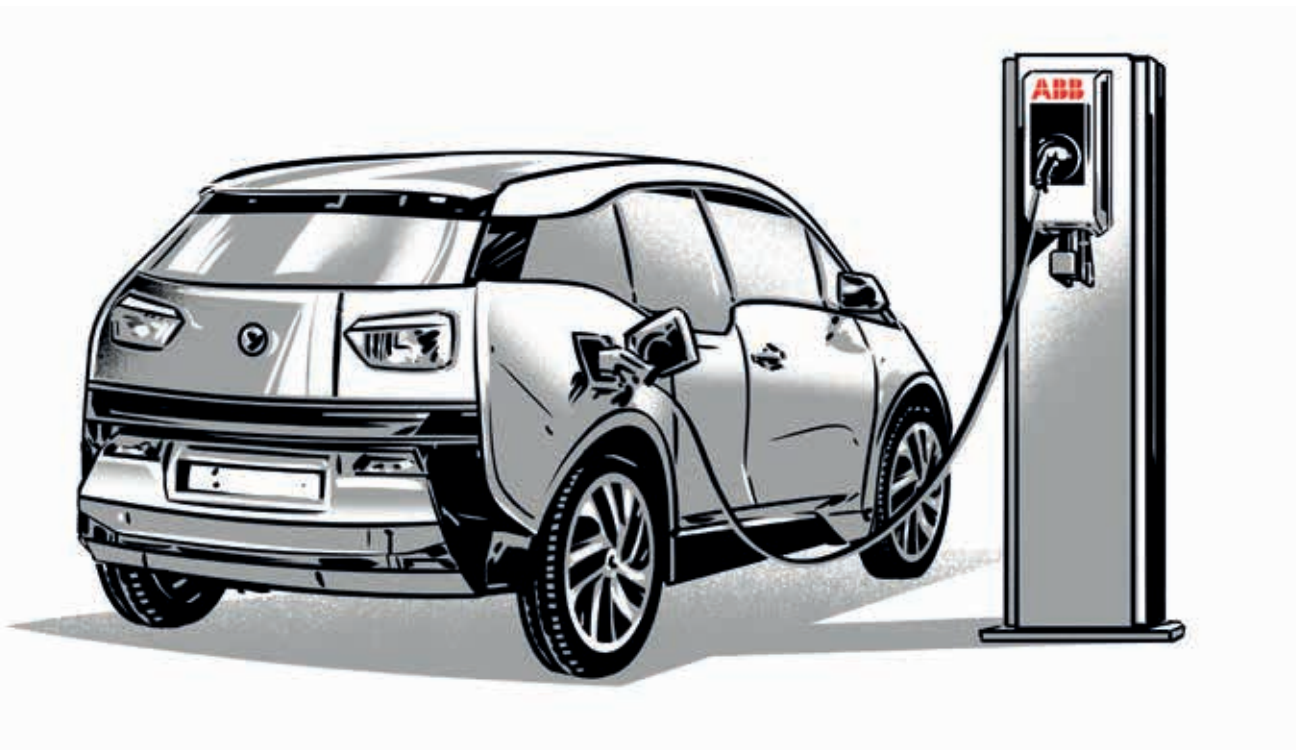
The company's business presidents explain why e-mobility and the ABB FIA Formula E Championship are important to their businesses.

Interview: **Jonas Hughes**

Tarak Mehta

President, Electrification business, ABB

The ABB FIA Formula E Championship offers a fascinating glimpse into the future of electric mobility. For ABB's Electrification business, it's more than just a competition, it's a platform to develop and test e-mobility-relevant electrification and digitalization technologies. Each race brings awareness of what is possible and feasible. The races themselves are inspiring, combining the excitement of a major sporting event with the knowledge that we are writing the future of sustainable transport.

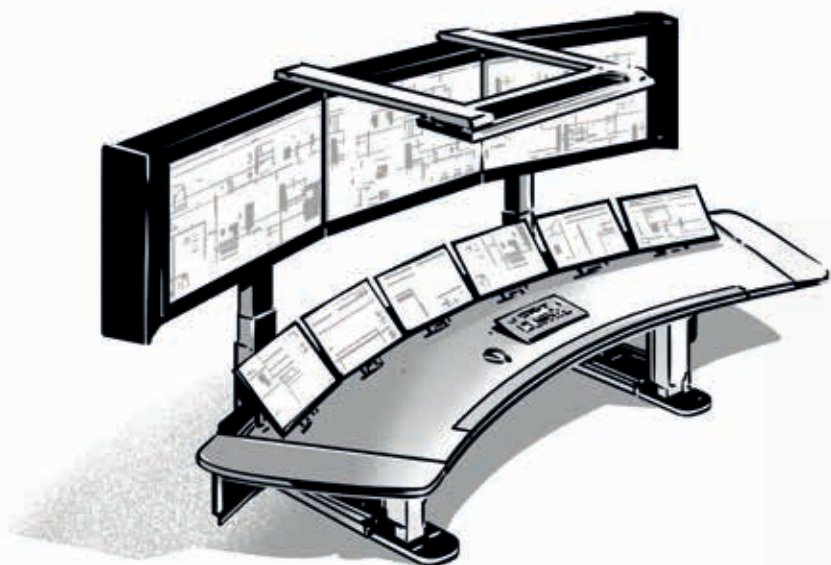


Peter Terwiesch

President, Industrial Automation business, ABB



As we evolve towards a new energy future, the ABB FIA Formula E Championship offers a unique opportunity to engage with our customers in process and hybrid industries on how to jointly shape the future of affordable, reliable and sustainable energy. With the races taking place in the hearts of cities, it is a great way to get the public and especially young people excited about the possibilities of engineering and technology. Moreover, e-mobility exemplifies rapid technology evolution, from race to race and from racing to serial production.

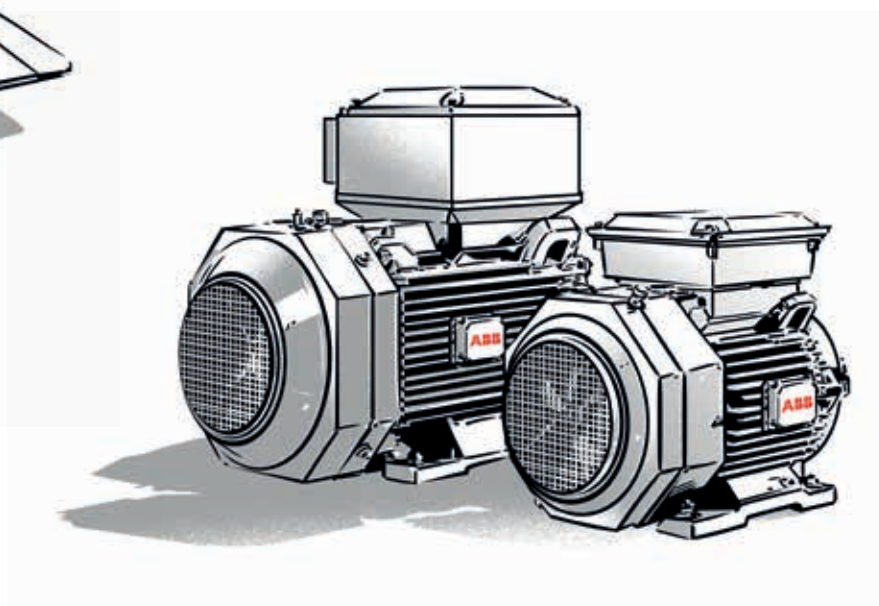


Morten Wierod

President, Motion business, ABB



The ABB FIA Formula E Championship is a great example of how the combustion age is giving way to the electrical age. Today, electric motors consume nearly 30 percent of the world's electricity and that proportion is rising as economies industrialize, and transport networks, vehicles and vessels are increasingly powered by electricity. As the global leader in electric motors, generators and drives, ABB's Motion business improves energy efficiency in all industries and applications for the benefit of our customers and the entire planet.

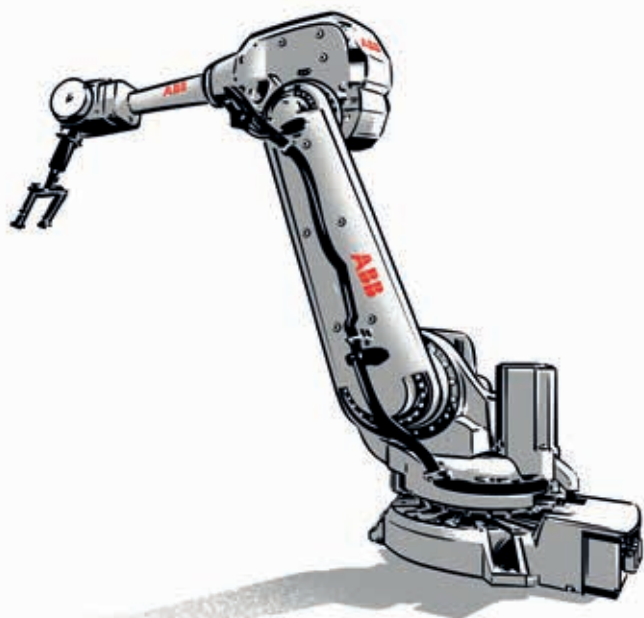


Sami Atiya

President, Robotics & Discrete Automation business, ABB

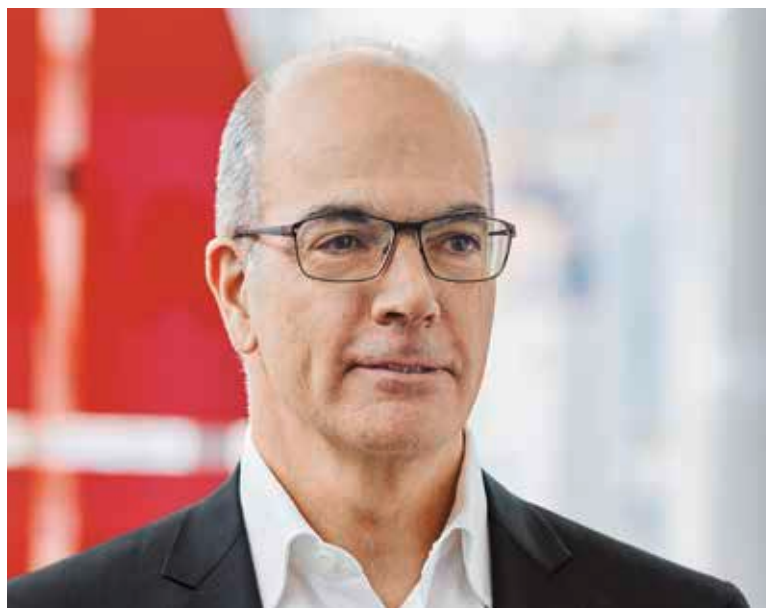


The ABB FIA Formula E Championship stands for a truly transformative new generation of cars – electric, sustainable and eco-friendly. ABB's Robotics & Discrete Automation business is helping to drive the digital transformation of the automobile industry – by providing automation and robotics solutions to electric car manufacturers, so ABB Formula E is a natural fit for us and for our customers. It highlights the benefit of future technologies and helps manufacturers test solutions across the e-mobility value chain. ABB Formula E provides the perfect setting to work with our customers and to show them how our robotics offerings can help them manage the transition to e-mobility smoothly, quickly and cost-efficiently, including with our portfolio of flexible robotics solutions for e-motor, battery and tray assembly.



Claudio Facchin

President, Power Grids business, ABB



The ABB FIA Formula E Championship pushes the boundaries of technology across the energy system. The switch to electric vehicles makes sense when this energy system is made sustainable through renewables. As the global leader, ABB's Power Grids business is at the forefront of integrating, transmitting and distributing reliable power, shaping the future of sustainable energy.

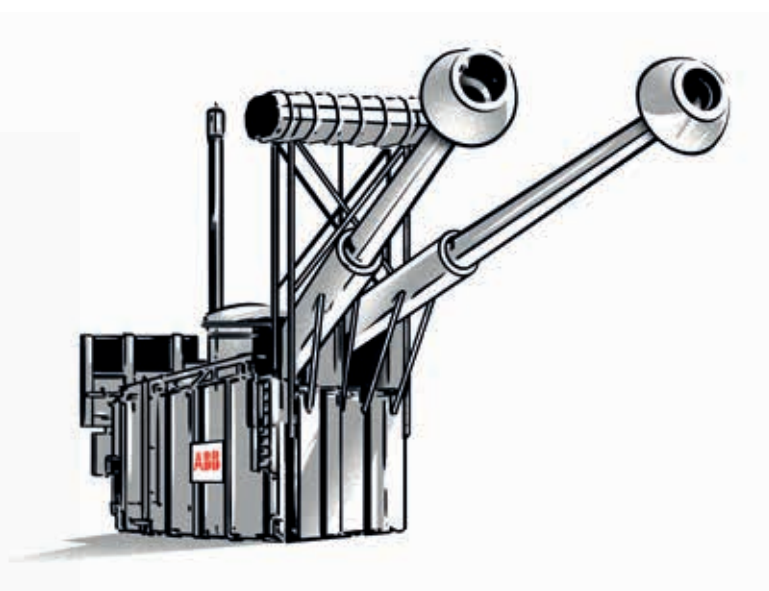


ABB: clear business structure and worldwide leadership

Driving the fourth industrial revolution

Now more than 130 years old, the industrial group ABB has always moved with the times and is a technology leader in many industrial fields today. Its five businesses – Electrification, Industrial Automation, Motion, Robotics & Discrete Automation and Power Grids – are supported by the overarching digital platform ABB Ability™.

Electrification

ABB's Electrification business offers a wide-ranging portfolio of products, digital solutions and services, from substation to socket, enabling safe, smart and sustainable electrification. Offerings encompass digital and connected innovations for low and medium voltage, including EV infrastructure, solar inverters, modular substations, distribution automation, power protection, wiring accessories, switchgear, enclosures, cabling, sensing and control.

Industrial Automation

ABB's Industrial Automation business offers a broad range of solutions for process and hybrid industries, including industry-specific integrated automation, electrification and digital solutions, control technologies, software and advanced services, as well as measurement and analytics, and marine and turbocharging offerings. Industrial Automation is number two in the market globally. Working closely with customers, ABB's Industrial Automation business is writing the future of safe and smart operations.

Motion

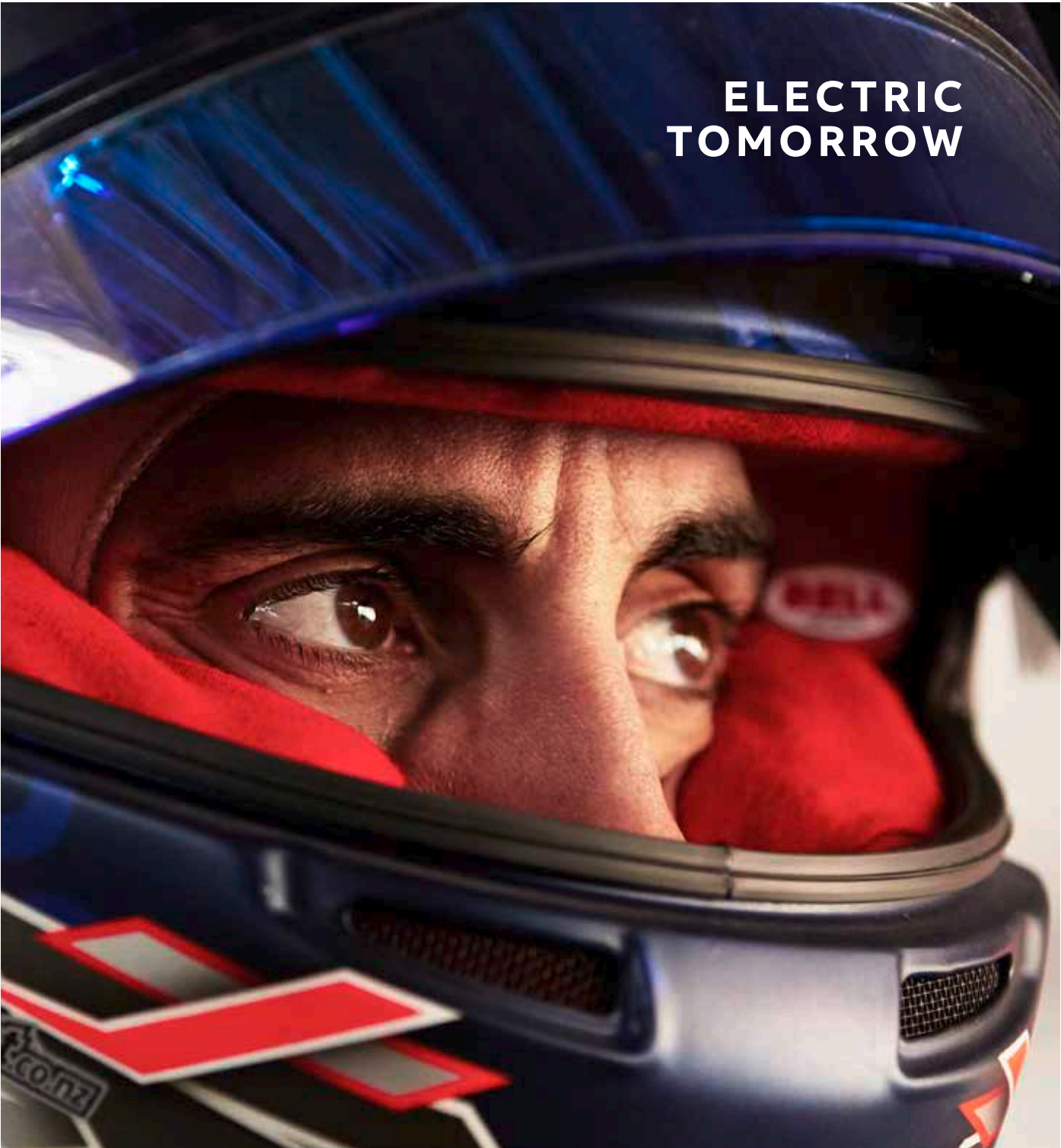
ABB is the world's leading supplier of drive systems and motors, serving customers in transportation, infrastructure and the discrete and process industries. We offer the complete range of inverters and converters, electric motors, generators, drives and mechanical power transmission solutions. Cutting-edge services and digital powertrain solutions complete the portfolio.

Robotics & Discrete Automation

ABB's Robotics & Discrete Automation business provides value-added solutions in robotics, machine and factory automation. Our integrated automation solutions, our application expertise across a wide scope of industries and our global presence deliver tangible customer value. Our focus on innovation includes extensive work in artificial intelligence, an ecosystem of digital partnerships and the expansion of our production and research capabilities through our USD 150 million investment in a new robotics factory in Shanghai.

Power Grids

ABB's Power Grids business offers power and automation products, systems, services and software solutions across the generation, transmission and distribution value chain. The industry-leading portfolio includes grid integration, transmission, distribution and automation solutions and a complete range of high-voltage products and transformers. ABB pioneered HVDC technology more than 60 years ago and is responsible for around half the world's HVDC installed base. ABB is the world's largest maker of transformers and a technology and market leader in high-voltage products and substation solutions, pushing voltages to record levels. ABB's Power Grid business is to be sold to Hitachi in 2020.





Simona De Silvestro

An all-new driving philosophy

Born in 1988, Simona De Silvestro was the first woman to earn points in Formula E. She is currently an ABB FIA Formula E Championship test driver, competes in the Virgin Australia Supercars Championship, and has climbed onto the podium in the IndyCar series in the US. Here, Simona De Silvestro describes the electrifying experience of piloting a Formula E racing machine. On the opposite page, scan the code to hear her commentary on one of Lucas di Grassi's drives.

Formula E is coming

When Formula E started in 2014, we were all pretty skeptical. It was so strange for us drivers, not to have the noise. The first time I drove a Formula E car felt totally unfamiliar. You suddenly hear different things, like the car bottoming out or the sound of the brakes. In Formula 1, you just see it. In Formula E, you also hear it.

And then came the Gen2. It was incredible. The Gen1 Formula E car was still just a regular car with a built-in battery and electric engine. The new generation is fully electric. And it's fast. The Gen2 is a real race car. It's amazing to drive. Its acceleration is extreme – and immediate. In every other series, you're faced with turbo lag. You have to wait a second before the acceleration kicks in. In the Formula E car, it's right there.

Charge the battery or charge ahead?

The driving is different: city courses tend to be rougher and tighter. You don't just drive

out onto the grass when there's an accident. If you misjudge your limits in the ABB Formula E, you're done. If you push too much, you'll crash, and if you push too little, you'll be too slow. All that to say: the driving is incredibly challenging. The input I get over the team radio goes beyond optimizing the racing line – we constantly have to strategize where it makes sense to save energy or when it's time to stop and charge the battery. In some curves, it's a bad idea to save energy because the risk of being passed is too high. It's a whole new take on handling the track.

In other series, it all comes down to tire management. You just floor it and brake before the curves. After flooring it in the ABB Formula E, you ease off the gas and pull the lever on the steering wheel to activate energy regeneration.

As the driver, you have to make far more decisions throughout the race: there are times you could pass, but it might waste precious energy. You're also tempted to conserve en-

ergy at the start of the race because running out of juice right before the finish line would be devastating.

Bird on the line

The communication between the driver and engineer is the most important of all. With every lap, you learn how to better handle the course. You already know it like the back of your hand because you've driven it countless times in the simulator for the two weeks leading up to the race, but then race weekend arrives and you experience and adapt to the real-life details of the course.

You may have it all stored in your mind, but there are significant differences when the rubber hits the road. Is the surface concrete or regular asphalt? Or maybe a bird lands smack in the middle of the racing line and you have to swerve slightly. You suddenly become a little more creative.

The perfect drive

Lots of people think that, as a test driver, I spend my days strapped into a race car, logging hundreds of kilometers at top speed. In reality, though, every team is strictly limited to three days of training. The rest of the time is spent practicing in the simulator and working out. I also drive in the Virgin Australia Supercars Championship, but still: the simulator is a race car driver's daily grind.

Even so, this is my dream job. Nailing the perfect lap during qualifiers has got to be one of the coolest things in the world. It's not something that happens every day. I've experienced it maybe six or seven times over the course of my career. The perfect lap, you know? The perfect drive.



Simona De Silvestro joined the TAG Heuer Porsche FE team as a test driver in the 2019/20 season.



Join Simona De Silvestro for a drive at the E-Prix in Rome.
Scan the QR code and go along for the ride.

ENGINE

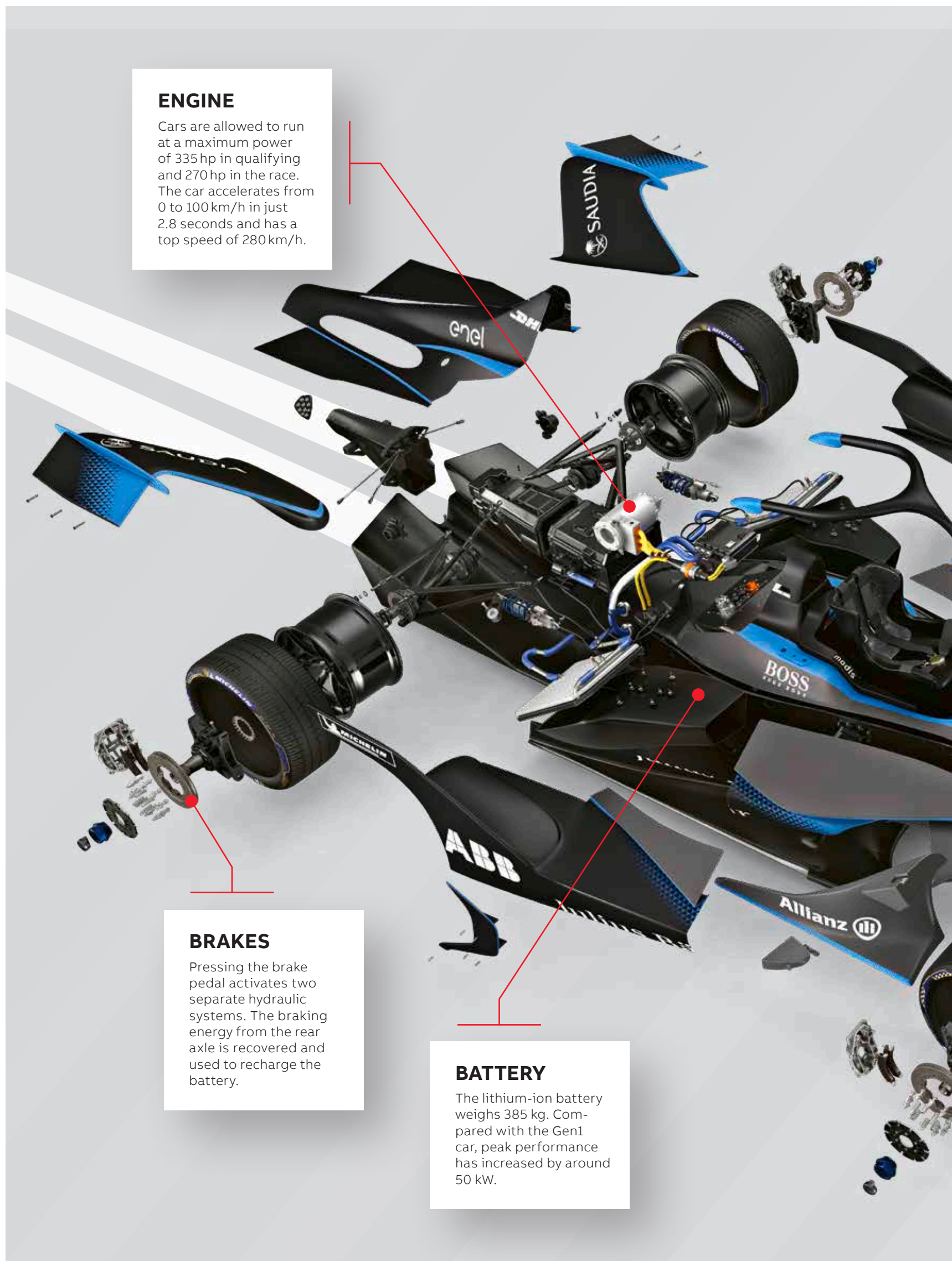
Cars are allowed to run at a maximum power of 335 hp in qualifying and 270 hp in the race. The car accelerates from 0 to 100 km/h in just 2.8 seconds and has a top speed of 280 km/h.

BRAKES

Pressing the brake pedal activates two separate hydraulic systems. The braking energy from the rear axle is recovered and used to recharge the battery.

BATTERY

The lithium-ion battery weighs 385 kg. Compared with the Gen1 car, peak performance has increased by around 50 kW.



HIGH TECH ON FOUR WHEELS:

THE 2ND-GENERATION
FORMULA E CAR.

STEERING WHEEL

The steering wheel is actually a high-tech interface. Its various buttons allow the driver to adjust a whole range of settings in the car. The Fan Boost button gives the driver extra power. The dashboard shows a variety of information, including data from the pits.

CHASSIS

An ABB FIA Formula E car is 5.16m long and 1.77m wide. The car and driver together must weigh a minimum of 900kg. All the teams run the same spec chassis.

THE CHALLENGERS, THE STARS AND THE CITIES

Porsche and Mercedes have just joined the Championship. With the addition of these two huge names, the sixth season of the ABB FIA Formula E Championship promises to be even more exciting. 24 top drivers in 24 high-tech race cars: teams representing the 12 most important electric car manufacturers competing on the streets of some of the planet's most iconic cities.



TOP DRIVERS

#11

**Lucas
DI GRASSI**

BRAZIL
8/11/1984
Audi Sport
ABT Schaeffler

RACES WINS PODIUMS

58 10 30

CHAMPION

1x

In 2014, di Grassi won the first Formula E race in Beijing and was key to the founding of the ABB FIA Formula E Championship.

#25

**Jean-Eric
VERGNE**

FRANCE
4/25/1990
DS Techeetah
Formula E

RACES WINS PODIUMS

56 8 20

CHAMPION

2x

Jean-Eric Vergne, of France, won the ABB FIA Formula E Championship in 2017/18 and 2018/19.

#23

**Sébastien
BUEMI**

SWITZERLAND
10/31/1988
NISSAN
E.DAMS

RACES WINS PODIUMS

56 13 25

CHAMPION

1x

Sébastien Buemi, of Switzerland, is one of the most successful drivers in the ABB FIA Formula E Championship series.

#18

**Neel
JANI**

SWITZERLAND
2/8/1983
TAG Heuer
Porsche FE

RACES WINS PODIUMS

2 0 0

CHAMPION

Neel Jani, of Switzerland, represents the German powerhouse TAG Heuer Porsche team in its debut season.

#5

**Stoffel
VANDOORNE**

BELGIUM
8/7/1991
Mercedes-Benz
EQ

RACES WINS PODIUMS

13 0 1

CHAMPION

Belgium-born Vandoorne has raced through the streets for the Mercedes-Benz EQ team for six seasons.

#20

**Mitch
EVANS**

NEW ZEALAND
6/24/1994
Panasonic
Jaguar Racing

RACES WINS PODIUMS

37 1 4

CHAMPION

Kiwi Mitch Evans has been racking up victories for the Panasonic Jaguar Racing team since 2015.

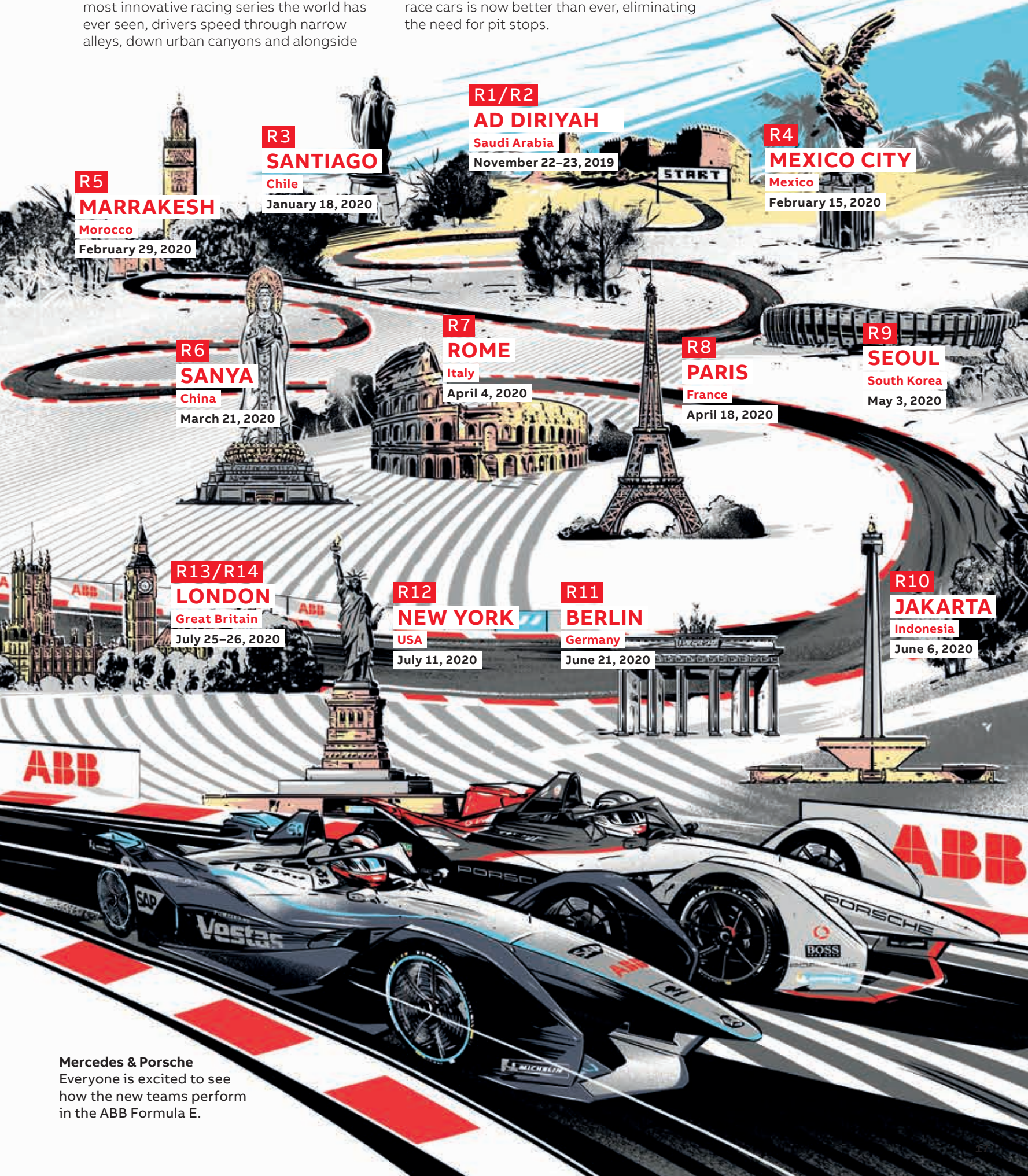
Scan the QR code
for more information on
the cars and drivers.



2019/20 RACE CALENDAR

The sixth season of the ABB FIA Formula E Championship will be held around the world in 12 cities and on five continents. In the most innovative racing series the world has ever seen, drivers speed through narrow alleys, down urban canyons and alongside

lakes or rivers. They push their machines to the max, at times hitting 280 km/h. The battery performance in these all-electric race cars is now better than ever, eliminating the need for pit stops.


R1/R2
AD DIRIYAH

Saudi Arabia

November 22–23, 2019

R4
MEXICO CITY

Mexico

February 15, 2020

R5
MARRAKESH

Morocco

February 29, 2020

R3
SANTIAGO

Chile

January 18, 2020

R6
SANYA

China

March 21, 2020

R7
ROME

Italy

April 4, 2020

R8
PARIS

France

April 18, 2020

R9
SEOUL

South Korea

May 3, 2020

R13/R14
LONDON

Great Britain

July 25–26, 2020

R12
NEW YORK

USA

July 11, 2020

R11
BERLIN

Germany

June 21, 2020

R10
JAKARTA

Indonesia

June 6, 2020

Mercedes & Porsche

Everyone is excited to see how the new teams perform in the ABB Formula E.

ABB Formula E check

What inspires you about the world's first electric race series?

Although it's still relatively new, the ABB FIA Formula E Championship has already attracted numerous fans around the world. There are many reasons behind their interest and enthusiasm. To find out more, we asked individuals from industry, science, politics and showbiz about the championship.

Michael Steiner

Member of the Executive Board for Research and Development at Porsche AG

“Entering Formula E and achieving success in this category is the logical continuation of our Mission E. The growing freedom for in-house technology developments makes Formula E attractive to us. Porsche is working with alternative, innovative drive concepts. For us, Formula E is the ultimate competitive environment for driving forward the development of high-performance vehicles in areas such as environmental friendliness, efficiency and sustainability.”



Anne Hidalgo

Mayor of Paris

“Fighting road traffic pollution is a priority for our cities and a daily challenge. Paris is committed to developing alternative modes of transport and supporting the transition to a 100% emission-free fleet. That's why we are proud to host the Paris E-Prix.”



Leonardo DiCaprio

Academy Award winner and
Formula E sustainability committee chair

“Projects like Formula E act like technological laboratories to accelerate innovation. For example, the battery duration of EVs will be increased thanks to the Championship. The trickling down of technological developments to consumer level and mass adoption will make a huge difference.”



Nick Rogers

Executive Director: Product Engineering at Jaguar

“Electric vehicles will absolutely play a role in Jaguar Land Rover’s future product portfolio, and Formula E will give us a unique opportunity to further our development of electrification technologies. It is my belief that over the next five years we will see more changes in the automotive world than in the last three decades. The future is about being more connected and more sustainable; electrification and lightweight technologies are becoming more important than ever as urbanisation continues to increase.”



Virginia Raggi

Mayor of Rome

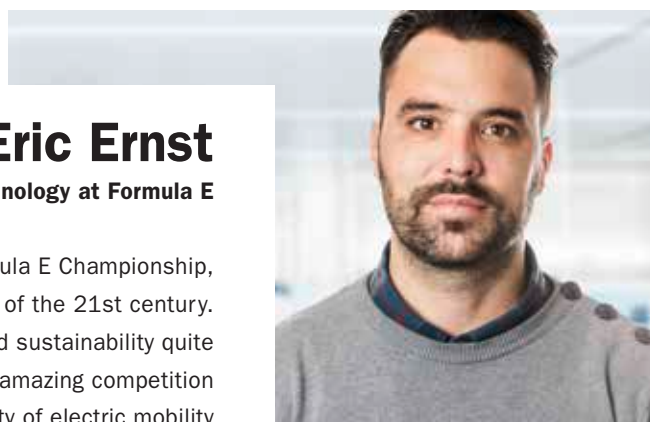
“The future of private mobility is electric. We are focusing a lot on this sector. We are trying to install as many electric charging stations as possible and working on bus and electric sharing systems. Thanks to technology, we can imagine a simpler future for those who decide to move to electricity. We only have one planet. If research helps us to live better, and respect our home, perhaps we have found the key to our present and future.”



Kariman Abuljadayel

Top athlete

“As well as the Ad-Diriyah Formula E race, I attended the Zurich E-Prix a few months ago. At both events, I saw how Formula E acts as a platform for technological and sustainable innovation through e-mobility. Advances such as battery life and efficiency have been steadily developing over the past years. As someone who likes to innovate, I find it fascinating!”



Eric Ernst

Head of Technology at Formula E

“I consider myself very fortunate in this role at the ABB FIA Formula E Championship, which is arguably the most exciting and innovative sports series of the 21st century. No other event combines sport, entertainment, technology and sustainability quite like Formula E does in iconic cities around the world. We put on an amazing competition together with our teams and partners, showcasing the maturity of electric mobility within the framework of Industry 4.0. Formula E stakeholders are also shaping the future in different sectors and areas such as mobility, banking, insurance, technology and energy through the global platform of the ABB FIA Formula E Championship.”

Jaguar I-PACE eTrophy

All-electric thrills!

In the very first season of the all-electric I-PACE eTrophy racing series, Jaguar and its official charging partner ABB have proven that electromobility can be both sustainable and thrilling. Competitive racing serves to test environmentally friendly technologies and traffic solutions for the future.

By **Christian Skalnik**



Reliable charging with the ABB Terra 53 DC fast-charging station.

The maiden season of the Jaguar I-PACE eTrophy could not have been more exciting: each of the first five races had a different winner, and by the end of the season the overall leader had changed seven times. The ultimate duel between Brazilian driver Sérgio Jimenez and American driver Bryan Sellers did not take shape until the final few races.

Sellers trailed the front-runner by a mere six points heading into the two final races in New York – which promised to be a neck-and-neck battle for the title. As is always the case

in motorsport, however, things didn't pan out as expected: during the qualifier, Sellers totaled his machine in a major crash and the repairs were too extensive to complete before the final competition. On July 13, 2019, Sérgio Jimenez entered the annals of international motorsport with a wire-to-wire win to become the first-ever Jaguar I-PACE eTrophy champion. With this victory, the 35-year-old secured EUR 550,000 in winnings and gained recognition throughout the world of motorsport.

The Jaguar I-PACE eTrophy is the first international competition for all-electric production cars. After being the first premium car brand to join the ABB FIA Formula E Championship in 2016, Jaguar launched the I-PACE eTrophy as another platform to showcase the technological advances being made in the booming global electromobility sector. As the main support series to the ABB FIA Formula E Championship, which focuses on high-tech race cars, the Jaguar I-PACE eTrophy features I-PACE production cars whose powertrain



Jaguar I-PACE: 500 km range, from 0 to 100 in 4.5 seconds.

and lightweight aluminum construction were slightly altered to allow for the FIA safety roll cage.


The car's technical specs are enough to excite motorsport fans: the standard 90 kWh lithium-ion battery that powers the I-PACE SUV lasts for nearly 500 kilometers. With a torque of 696 Nm, the 294 kW (or 400 hp) powertrain accelerates from zero to 100 in just 4.5 seconds, sending the speedometer to

charging solutions, this was reason enough to join the Jaguar I-PACE eTrophy as its official charging partner – after already becoming the lead partner of the ABB FIA Formula E Championship.

The everyday challenges of all-electric motorsport were enough to show ABB engineers that they couldn't have chosen a better platform for developing their products. For example, they recently test drove an I-PACE

all twelve of the vehicles in the lineup. Although the breaks between training rounds, qualifiers and the 25-minute race were often extremely short, the Terra 53 DC fast-charging stations withstood the strain: these 50 kW direct current chargers, bestsellers in both Europe and North America, can recharge a battery within 15–30 minutes. Even a completely drained battery can reach an 80% charge in about 40 minutes.

In order to transport the twelve fast-charging stations more easily to the various host cities, however, they had to be redesigned. Because the standard design was simply too big to transport by cargo plane, an ABB team based in India dismantled the insides of these high-performance machines and repacked it all into a rolling container just 1.5 meters tall. This represented a reduction in height of one third, without any impact on the chargers' performance.

Frank Mühlön, Head of ABB's Global E-Mobility Infrastructure Solutions, sees this as just one example of how electric motorsport can advance the development of sustainable solutions in transportation. There are many more solutions to come: "ABB's ability to master challenges by means of innovative technology will not only power future developments in electric motorsport, it will shift the very boundaries of electromobility," Mühlön states. 

"ABB's ability to master challenges by means of innovative technology will not only power future developments in electric motorsport, it will shift the very boundaries of electromobility."

a max of 195 km/h. These impressive specs secured a hat trick for the I-PACE at this year's World Car Awards, where it was decorated as World Car of the Year, World Car Design of the Year and World Green Car 2019.

Despite these milestones, one thing is clear: the development of electromobility has nowhere near reached its pinnacle. For this very reason, all-electric racing series serve not only to showcase existing technologies but to highlight advances made in developing and testing sustainable solutions in mobility. For ABB, the global leader in electromobility

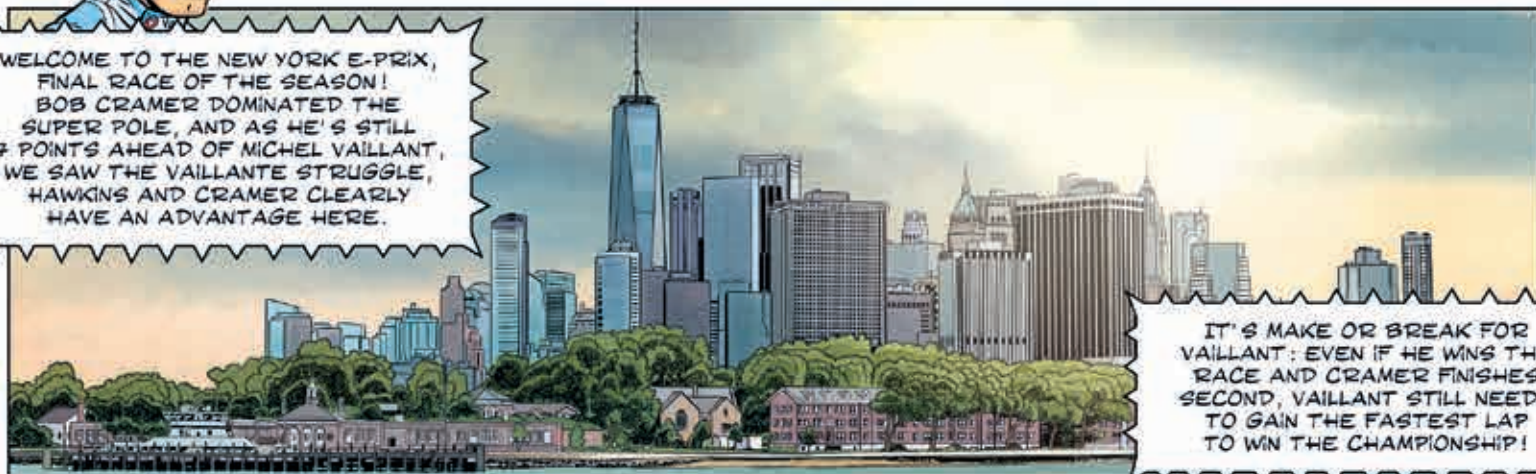
eTrophy SUV inside the Arctic circle to explore the performance limits of standard ABB fast-charging stations. They discovered that the 50 kW direct current (DC) charging stations designed for outside temperatures ranging from –35°C to 55°C functioned smoothly, even under extreme Arctic weather conditions.

The eTrophy series benefited from this reliability all season long. From the rainy debut race in Saudi Arabia to the heat wave in Mexico, from Hong Kong and China to the races in Europe and the US, ABB's charging infrastructure provided smooth charging for



Michel Vaillant - SEASON FINAL -

WELCOME TO THE NEW YORK E-PRIX, FINAL RACE OF THE SEASON! BOB CRAMER DOMINATED THE SUPER POLE, AND AS HE'S STILL 7 POINTS AHEAD OF MICHEL VAILLANT, WE SAW THE VAILLANTE STRUGGLE, HAWKINS AND CRAMER CLEARLY HAVE AN ADVANTAGE HERE.



IT'S MAKE OR BREAK FOR VAILLANT: EVEN IF HE WINS THE RACE AND CRAMER FINISHES SECOND, VAILLANT STILL NEEDS TO GAIN THE FASTEST LAP TO WIN THE CHAMPIONSHIP!

YOU'RE FOURTH ON THE GRID, MICHEL. EVEN IF YOU JUST GOT THE FANBOOST, YOU'LL HAVE TO DRIVE THE WHEELS OUT OF THE CAR TO WIN THIS.

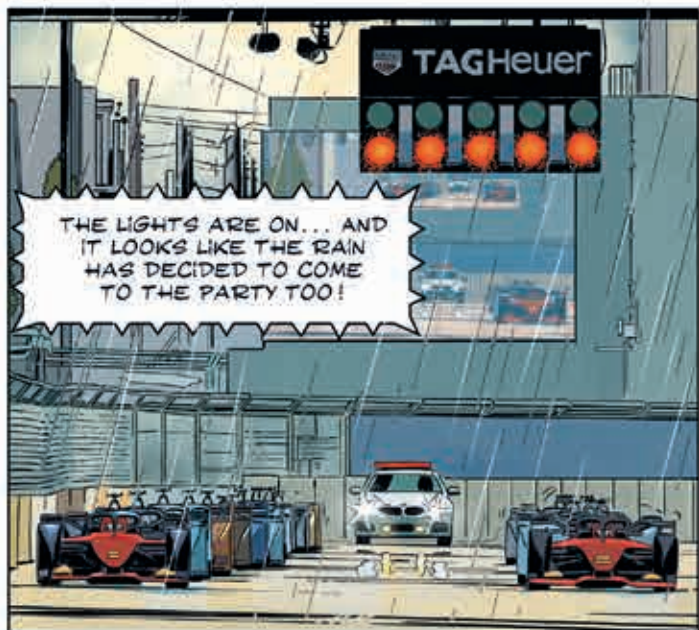
YEAH, WELL, CRAMER AND HAWKINS DIDN'T EASE THE FIGHT. I DON'T UNDERSTAND HOW I CAN'T KEEP UP WITH THEM, THEY'RE SO FAST!

YOU'RE NOT AT FAULT HERE, MICHEL.

BOB DIDN'T BECOME SUDDENLY BETTER. WE THINK THEY HAVE AN ADVANCED GEARBOX, MAKING THEIR CARS CONSISTENTLY FASTER



THE LIGHTS ARE ON... AND IT LOOKS LIKE THE RAIN HAS DECIDED TO COME TO THE PARTY TOO!



AND WE GO GREEN IN NEW YORK CITY! IT'S A VERY GOOD START FOR VAILLANT!



... OH! HAWKINS GOES WIDE ON THE WET!

YES!! GET CRAMER NOW!



HE'S TOO FAST! I CAN BARELY KEEP UP!



DAMN IT. LET'S DO THIS.



MICHEL?! WHAT'S HAPPENING! YOU'RE FALLING BEHIND! THERE'S ONLY TWO LAPS LEFT!

I KNOW WHAT I'M DOING!









In conversation with Anne Hidalgo, Mayor of Paris

In Paris, our top priority is to develop mobility

Paris has hosted ABB FIA Formula E races since 2016 and is also one of the C40 cities. We caught up with Anne Hidalgo to talk about the ABB FIA Formula E Championship, electromobility in the Paris metropolitan area, her commitment to reducing emissions in the city and the reaction of residents.

Interview: **Marianne Weibel**

The first ABB FIA Formula E race held in Paris took place in 2016. Tickets sold like hot cakes and millions of French people followed the race on television. How did you manage to achieve that level of public enthusiasm for the city center race?

It was due largely to the choice of venue, which was helped by both the military governor of Paris and the race organizers. I would like to take this opportunity to thank them once again. We were so lucky to be able to offer a backdrop like the Hôtel des Invalides. Paris wanted to share in the venture that Jean Todt had dreamed up a few years earlier.

The popularization of increasingly affordable electric vehicles and the integration of e-racing in an urban environment proved a tremendous catalyst for the development of local pollutant and greenhouse gas-free technologies. It was a bold venture and it paid off: today almost all the world's car manufacturers are involved in the championship. The vehicle range has increased – they can now go a whole race without recharging. This is a crucial step forward and certainly makes this type of vehicle more attractive.

In addition to this welcome development, the Paris ePrix pulls in a big audience. The grandstands are fully booked every year and the E-Village, which spectators can access for free, offers a bustling, immersive experience. The Paris ePrix has become the city's festival of eco-friendly driving.

What does ABB Formula E do for Paris?

We know how important it is nowadays to get behind the fight against climate change. The air in our cities is too polluted. We can't just sit by and let it happen – everyone's health is at stake.

We need to act as quickly as possible to change certain aspects of our behavior and our transport and consumer habits.

Vehicles that emit CO₂ and particulates must be replaced with more eco-friendly vehicles to ensure better, healthier living conditions for everyone. And there are other challenges in the urban outskirts and remote areas.

ABB Formula E demonstrates to both locals and visitors that more eco-friendly transport options are available, even in the high-powered world of motor racing – and that they can be just as exciting and enjoyable. These races reach a wide audience of sports fans and car enthusiasts, who are discovering just how efficient the new motors are. We are also demonstrating that Paris is not anti-car! Paris is anti-pollution.

Have you been able to achieve your aims?

Our aim was to show that electric vehicles such as cars, and also trucks, buses and e-bikes are just as efficient as their conventional counterparts. And that is now the case. All manufacturers are focusing on this now. Confidence in these means of transport is growing, and more and more people in France are using them.

Paris has made huge efforts to encourage eco-friendly transport. We introduced the Vélib' rental scheme in 2007 and we have invested in public transport, cycle lanes and charging stations for electric vehicles. We will continue to push this development because we are committed to finding solutions that make the city calmer and which improve our quality of life.

As far as the event itself is concerned, we are working to reduce the amount of CO₂

produced, to reuse materials and minimize what is left behind for the people of Paris every year.

What's the next step? A switch to electric boats on the Seine?

Yes, we're actively working on that. Incidentally, all the material required for the ABB FIA Formula E race is shipped in along the Seine. This is true of a lot of goods today – they're transported by river.

But this must be done without causing extra water pollution because we want people to be able to swim in the Seine again in the near future – if possible, before the Olympics and Paralympics in 2024. Work still needs to be done on the boats' engines, but the initial solutions are already evident. Fludis, the first electric boat with significant freight capacity, was recently launched in Paris. We have been urging Île-de-France Mobilités, the public transport authority for Île-de-France, to do more to develop passenger transport on the waterways for many years. The SeaBubbles – taxis that glide over the water – are finally being tested on the Seine and will soon be available to the public.

A lot of major cities have followed your lead. How did you persuade your colleagues?

Paris is very popular around the world. I'm president of C40 Cities, a group of 98 cities around the world looking for solutions to shared environmental challenges. In this capacity, I've spoken to many other mayors who want to know how useful the event is.

The race is now well established on Paris's calendar and its public success legitimizes it since its significance is understood. I haven't had any real difficulties in convincing local



Anne Hidalgo: "Paris is making enormous efforts to promote eco-friendly transport."

politicians who are planning to bring the event to their city of its advantages.

As a member of C40 Cities, you are committed to improving air quality in the city and ensuring better quality of life for residents. According to press reports, you are planning to tackle air pollution by introducing 800 electric buses by 2024, and banning diesel and gasoline vehicles from 2030. What are the biggest challenges involved in the switch to electromobility?

The development of mobility within the city and in the metropolitan area is, of course, our top priority. We have set up a low-emission zone and will gradually introduce bans for the most polluting vehicles. Diesel vehicles will not be allowed from 2024, and we are aiming to eliminate all vehicles with combustion engines by 2030. To achieve this, we need to ensure that all residents of the city and the metropolitan area, and all tourists, have access to efficient means of transport.


This is why we are involved in financing RATP's bus upgrade plans. It wants to switch its entire fleet to electricity or natural gas by 2025. We are working on repurposing the former Autolib' charging stations to provide a dense network of electric charging points. We are also promoting the development of car-sharing schemes, particularly Mobilib'. For some years now, we have been expanding the network of cycle paths throughout Paris, supporting a genuine Parisian cycling revolution. Cycling is finally – once again – a truly efficient means of getting around the city. It's vital that we continue these efforts.

The Olympics will be held in Paris in 2024. Are you planning to present Paris to the world as a low-emission city?

Paris is innovative – a city that inspires and motivates other cities in France and around the world to follow suit. It's important that we set an example.

The Olympic and Paralympic Games have become a catalyst for these necessary changes, and will also allow us to showcase our innovations in areas such as transport, energy and waste recycling. Our ambition is to deliver a new, more responsible Games, with long-term benefits for everyone and minimal impact on the environment ... and of course we want our French athletes to win lots of medals!

What are you looking forward to most at the next ABB FIA Formula E race in Paris?

A race that draws in the crowds. These race cars are faster and more eco-friendly than ever before, and we want as many people as possible to see that the ecological transformation underway is not about punishment – it's about the chance of a better life! 



In conversation with Michael Müller, Mayor of Berlin

Getting Berliners on board with new mobility solutions

The law is being used to encourage Berlin's residents to get behind emission-free transport solutions. That may sound a little draconian, but the new mobility solutions are actually improving Berliners' quality of life. And enthusiasm is rising, not least as a result of events such as ABB Formula E.

Interview: Marianne Weibel

You have described Berlin as big, boisterous, endearingly direct, not always easy and different for everyone. You see Berlin as a city that is constantly changing, but always true to itself. And you want Berlin to be a city that offers its residents a high quality of life. One important factor here is mobility. Where do you see the greatest challenges for future mobility?

The challenge is to listen to the interests of all parties involved and then get them excited about new mobility solutions. Berlin has become the first German city to pass a mobility law that will enable Berliners to enjoy climate-friendly, safer and more efficient mobility.


Can you explain how the mobility law works in practice?

The mobility legislation has several components that cover all means of transport. Individual elements are being introduced gradually; together, they are designed to facilitate future-oriented mobility. The first three components describe general, intermodal targets and regulations for local public transport and cycling. The components covering pedestrians and new mobility (car sharing, digitalization and other future themes) will follow in 2020. Commercial transport will also be regulated in greater detail – building on our integrated commercial transport concept.

As co-founder of C40 Cities and a signatory of the Green & Healthy Streets Declaration, Berlin is committed to becoming an emission-free city by 2030. What exactly are you doing to achieve that target?

Basically, we want to transform a major part of the city into a place without fossil fuels. First, we want to encourage cycling by creating 1,000 new cycle paths, upgrading existing paths and installing 27,000 bike parking facilities. Second, we want to expand the available public transport and encourage private transport users to switch to emission-free vehicles. But Berlin is also subject to federal legislation and of course the decisions of the “climate cabinet”, which we will now have to examine in detail.

Berlin has been an ePrix host city since 2017. As a host of the ABB FIA Formula E race, do you want to raise awareness of electromobility?

Yes, among other things. Racing cars with electric motors are a good advertisement for innovative technology and sustainable mobility in an urban environment. And electromobility is the key to eco-friendly transport in 21st century cities. So I'm very happy that ABB Formula E will be visiting Berlin again in 2020. It's a thrilling event, as motor racing fans will testify. And it also demonstrates the technology's capabilities to a huge audience – in spectacular style and in a very special setting. 



Michael Müller, Mayor of Berlin.

Trondheim, Norway

A city turns green

Norway, a country renowned for its use of green electricity, is relying increasingly on eco public transport. ABB has installed a revolutionary charging infrastructure in Trondheim for the first bus network that uses no fossil fuels.

Text: **Christian Skalnik**

The effects on the quality of life were noticeable from day one: since August 3, 2019, the city of Trondheim has become significantly quieter and its air quality has improved markedly.

That was the day on which the transport operators in Norway's third biggest city fundamentally reformed local public transport. Following the introduction of differentiated vehicle tolls and "low-emission" or "car-free" zones in the city center, the next move was to offer passengers a comfortable and sustain-

able alternative to private transport through new public transport routes, shorter intervals and a digital route planner.

But the most important change was the introduction of 36 new, all-electric vehicles to operate alongside the existing biogas and bio-diesel buses.

The move makes Trondheim the world's first major city to operate a completely fossil fuel-free bus network. This chimes perfectly with Norway's energy policy, which at first glance appears a little paradoxical. Despite

being the most oil-rich country in western Europe, its population of 5.3 million uses primarily electricity. In Switzerland, only about 25% of the primary energy consumed comes out of a socket; in Norway, the figure is more than 62%. And what's best is that a staggering 95.8% of this electrical energy comes from renewable sources, primarily the country's abundant hydro power reserves.

Norway applied its pioneering energy policy to road transport from a very early stage. As one of the first countries to introduce zero-emission technology to the transport sector, it has undergone a trailblazing revolution in this area in the space of less than a decade. In 2013, only 5.5% of new car buyers chose an all-electric model. By 2018, this figure had risen to 31.2%. This means that in 2018 more electric cars were sold in Norway than in Germany, which has almost 17 times its population.

With plug-in hybrids included, every other newly registered car in Norway features an electric drive system. Electric models have now reached a market share of 49% – putting the country way ahead of other electromobility pioneers.

By comparison, in second-placed Iceland the figure for electric and hybrid models is about 12%, in Switzerland 7% and in Germany only 2%.

The clear aim is to remove diesel and gasoline vehicles completely from Norway's roads in the near future. From 2025, no one will be allowed to buy or sell vehicles with a conventional combustion engine.

At the same time, there is a focus on encouraging electromobility. Those that choose an eco-friendly e-model do not have to pay vehicle registration tax and have been exempt



A brief top-up at the bus station: Volvo bus and ABB charging infrastructure.



35

fully electric buses



3-6

minutes charging time



450_{kw}

charging power
per HVC



100%

emission-free

from road tolls and parking charges since 1997. Electric cars are also allowed to use the bus lanes throughout the country. In 2011, sales tax was waived on electric car purchases, instantly making the sustainable vehicles 20% cheaper and thus financially competitive.

Norway laid the foundations for its practical public charging infrastructure back in 2009 and has been expanding the network at impressive speed ever since. In the capital Oslo, drivers of electric vehicles can recharge at more than 1,300 public charging stations for the equivalent of EUR 1 an hour.

Admittedly, most of these stations are still comparatively slow, but the advance of fast-charging technology is inexorable. The number of high-speed chargers increased by 30% in 2017 alone. With fast-charging points located every 50 km along major highways, the “range anxiety” experienced elsewhere is not a problem in Norway, and in terms of convenience the technology now rivals the conventional fuel pump. More than 800 of these fast chargers were supplied by the world’s leading provider of electromobility charging solutions, ABB. The company’s latest launch shows the direction in which developments are going: the top-of-the-line Terra HP model can recharge for a range of 100 km in just four minutes.

It was developments such as this that led the first garage operator in Oslo to replace a number of its gasoline and diesel pumps with ABB fast chargers in summer 2019. The developments have also helped advance the electrification of local public transport. Last year, for example, Oslo purchased almost 100 electric buses and has been gradually putting them into operation over the course of 2019. When this is complete, Europe’s “Environ-

mental Capital 2019” will be running the largest fleet of electric buses of any comparable European metropolis.

The benefits of investment such as this can be predicted by looking at Trondheim’s example. The decision to run public buses on biofuels instead of conventional diesel or natural gas reduces nitrogen oxide emissions by about 60% and CO₂ emissions by about half. The four new, 12–15 km, fully emis-

“We’re laying the foundations for an environmentally aware energy revolution that will ensure safe, smart and sustainable mobility for future generations.”


sion-free electric bus lines will help to save a further total of about 2,000 metric tons of CO₂ a year in comparison with fossil fuel fleets. In other words, the equivalent of more than 12 million medium-sized garbage bags, or the greenhouse gas emissions of approximately 10 million km traveled by car.

Another reason to feel optimistic about the future: Norway’s efforts have set in motion an innovation spiral that will create new solutions for each new challenge. The city of Trondheim was faced with the usual problem that the buses for the new electric fleet were purchased from different manufacturers. The 25 Volvo buses have to be charged at 300 kW, whereas the 11 vehicles manufactured by Heuliez require a 450 kW charge.

While other municipalities have had to set

up two parallel charging infrastructures, those in charge of today’s technology capital took a different approach and chose a revolutionary system developed by ABB in collaboration with the bus suppliers. The Swiss technology leader’s Heavy Vehicle Chargers (HVC) are the first that allow vehicles from different manufacturers to be charged at the same charging station. And they do it in record time too. Thanks to digital solutions from the ABB Ability™ portfolio, the eight charging points set up at the termini can be serviced remotely and take three to six minutes to charge the bus batteries with enough power for the next loop.

“The implementation of such major projects involving various manufacturers is possible because ABB believes in developing standardized, interoperable technology,” says Tarak Mehta, President of ABB’s Electrification business and member of the Executive Committee of the ABB Group. “We’re laying the foundations for an environmentally aware energy revolution that will ensure safe, smart and sustainable mobility for future generations.”

Let us hope that the Norwegian precedent soon becomes the norm. 

Davos

Alpine showcase for the future of electric transport

Train, bus, lift or automobile: Davos' clean, climate-friendly, sustainable and future-proof transport concept and its eco-friendly generation and distribution of electricity are the envy of cities around the world. ABB's innovative technology helped make them possible.

Text: **Christian Skalnik**

If you're looking for standout destinations in the Alps, there's no ignoring Davos. For politicians and top management, it is the world-renowned host of the annual World Economic Forum (WEF). Wealthy tourists enjoy Davos as a fashionable winter sports resort and literature lovers cherish it as the setting of Thomas Mann's famous novel, "The Magic Mountain".

But in recent years Europe's highest city has come to be appreciated from a completely new angle. As the world seeks answers to the current climate crisis, the little municipality (population: 11,000) has become something of an eco showcase, demonstrating how we can use existing resources sparingly in a range

of areas from energy production to transport.

Although it may appear to be the result of some long-term master plan, that could not be further from the case. What happened was that a number of disparate, forward-looking projects gradually merged into a unique, green concept.

Looking back, however, there was always one constant: Switzerland's ABB has been involved in nearly all these projects since the beginning of the last century – and remains the key provider of the latest, sustainability-focused technology.

This was evident at WEF 2018, when new electric buses stopped in front of the Congress Center to chauffeur guests and dele-

gates silently and emission-free from one conference site to the next or to the railway station.

The new TOSA e-buses were able to operate continuously, without the usual downtime for charging, thanks to new, fast-charging technology, developed by ABB, that earned the buses the Swiss Federal Office of Energy's Watt d'Or 2018. At certain stops, an extending robotic arm on the bus roof connects to an overhead charging station to flash-charge the batteries with a 600 kW boost of power that lasts comfortably for 2–8 km of onward travel. The whole process takes as little as 20 seconds – no longer than the passengers need to board and exit.



Electric bus with prize-winning ABB technology: TOSA e-buses operate continuously with 20-second charging stops.

To cater for environmentally aware guests who prefer to arrive by car, the municipality of Davos installed an extensive infrastructure for electric vehicles as part of a public-private partnership with ABB and the local energy supplier. Eight ABB Terra 53 charging points were installed for the occasion – and have been in operation ever since. These 50 kW stations are the bestselling variant in Europe and North America and can boost the charge level of an electric automobile from 0 to 80% in just 12 minutes.

Crucially, all the electricity delivered by the charging points in Davos derives from renewable sources. The power is generated by the local power plant, which has used ABB technology since it first opened. The hydroelectric plant was one of the first projects that ABB's predecessor Brown Boveri & Cie (BBC) worked on in this region, and its twin water turbines still supply the city with clean electricity.

Davos' consistent, sustainable electromobility infrastructure has attracted interest far beyond the bounds of the WEF and is now seen worldwide as a model for future-proof, clean, climate-friendly and sustainable transport.

However, both the municipality and ABB are keen to keep the momentum going. In 2019, visitors to the WEF were able to choose eco-friendly transport for the entire journey from Zurich airport to Davos. Car manufacturer Audi provided 50 E-Tron sedans and ABB installed 31 fast-charging stations under the aegis of IONITY, a joint venture charging infrastructure set up by leading car manufacturers.

Thus, ABB has continued its long tradition of providing the region with new and forward-looking forms of mobility. Last but not least, the electric funiculars and chairlifts on the slopes in and around Davos have always been powered by energy-efficient ABB motors. One of the early projects was the construction of the historic Schatzalp funicular, opened in 1924 and still in service today. Similarly, the Davos-Parsenn railway, which is central to Graubünden, was equipped by ABB predecessor and electrification pioneer Brown Boveri in the 1930s.

Over the years, ABB has also been involved in providing eco-friendly innovations for rail routes in the area. BBC supplied the legendary narrow gauge locomotives (known as




Environmentally friendly travel from Zurich to Davos, thanks to ABB charging technology.

“Crocodiles”) for the Rhaetian Railway, and the electrification specialist equipped the world-renowned “Allegra” trains, introduced in 2010, with highly energy-efficient drive packages. In terms of environmental impact, these trains allow passengers – including climate activist Greta Thunberg, who attended WEF 2019 – to travel with a clean conscience. The system, designed specifically for the challenges of the extremely steep, mountainous terrain, generates power through recuperation on downhill sections, thus feeding part of the energy consumed back into the grid. The pantographs also act as icebreakers by thawing frozen overhead lines with artificial flashes of lightning.

The fact that passengers have been able to

travel from Landquart to Poschiavo for several years without a change of train is thanks to another special development created by ABB engineers, which enables the same railcars to travel on both the 1 kV direct current Bernina line and the other sections with 11 kV alternating current.

This may have been one of the reasons behind the Rhaetian Railway's unusual move in 2015, when it decided to paint one of its traditional red railcars white and add a large logo. As it makes its way through the mountains around Davos, the striking “ABB Allegra” symbolizes more than 100 years of collaboration between the two pioneering companies. 

Porsche Taycan & Terra HP

Electric turbo boost

With an output of 760 hp, the Porsche Taycan represents a new dimension in electromobility. The all-electric sports car is the first series-produced vehicle to fully benefit from ABB's forward-looking fast-charging technology. The charging stop for a 100 km range takes just four minutes.

Text: **Christian Skalinik**

From Oslo to the Austrian Tyrol and back north to Stuttgart: the 20-vehicle convoy covered about 6,000 km – and caused something of a sensation at service stations along the way.

What confused the crowds that gathered each time the vehicles stopped was not so much the shimmering metallic cars as the unexpected style of refueling: instead of stopping for premium gasoline, the sports cars, which were instantly recognizable as a new Porsche model, headed for the more remote electric charging points.

They parked there just long enough for interested onlookers to glean some of the basic details of this potentially record-breaking electric production model, due to be launched in 2020. The Porsche Taycan will be available in a “small” 680 hp variant and in the Turbo S variant with 761 hp. Driven by two 800 volt synchronous motors, it takes just 2.8 seconds to accelerate from 0 to 100 km/h and has a top speed of 260 km/h. The battery has a usable capacity of 83.7 kWh – which, depending on driving style, could reasonably be expected to produce a range of about 380 km to 410 km.

But it's another feature that will earn the Taycan a place in the history of electromobility: the first all-electric Porsche is also the world's first series-produced vehicle that can be charged at up to 270 kW – and even with a possible 350 kW update in the foreseeable future.

Those not up to speed with electromobility may need a brief introduction to the principles of charging technology to grasp why this is so revolutionary. The length of time it takes to recharge an empty car battery depends on its charging capacity and also on how much electricity the charging point delivers per

hour. With a standard household socket, the figure is 2.4 kW. Three-phase connections – used for electric cookers, for example, and often for charging electric cars in the garage at home – deliver 11 kW, and most public charging points deliver between 20 kW and 50 kW.

For example, the Taycan, which has a gross battery capacity of 93 kWh, achieving a full charge via a domestic socket would take about 39 hours, at a wallbox approximately nine hours and at a standard charging station between two and four hours.

On their European tour, the Porsche test drivers demonstrated that electromobility and long-distance travel are no longer mutually exclusive. The charging stops of only a matter of minutes were primarily the result of revolutionary charging technology from ABB. The global market leader in fast-charging solutions, which in other business areas offers innovative drive systems, collaborative industrial robots, electrification solutions and smart power grids, moved into the charging infrastructure business back in 2010 and has since set new standards with a stream of innovations.

The pioneering Swiss company presented its latest highlight at last year's Hanover Fair: ABB's top-of-the-range Terra HP model charges electric cars at up to 350 kW – in other words, it operates at about seven times the power of most conventional curbside models.

Yet again, ABB was ahead of its time with this innovation. When the Terra HP was first launched, no series-ready electric cars on the market were able to cope with its power input. The Taycan is the first car able to use the full capacity of the world's most powerful



About seven times more power than conventional charging points: ABB's top-of-the-range Terra HP model charges at up to 350 kW.

fast charger. The time it takes to change its depleted batteries is comparable to a refueling stop at a conventional pump. With 270 kW charging, as available at the launch, a little over five minutes at the ABB fast charger delivers enough energy for the next 100 km. If Porsche goes ahead with the upgrade to 350 kW, Taycan drivers could be on their way again after only four minutes.



From 0 to 100 km/h in 2.8 seconds: the Porsche Taycan represents a new benchmark in electric private transport.

Although electric “turbochargers” like this are not yet universally available, that will quickly change as the charging technology forges ahead. ABB alone has already installed more than 11,500 high-speed charging points – including about 1,800 with an output of 150 kW to 450 kW – in more than 70 countries around the world, and is working with numerous partners to connect the global fast-charging network.

In June 2018, IONITY, a joint venture of BMW, Daimler, Ford and the VW Group with Audi and Porsche, celebrated the opening of the first service station with six Terra HP points on the A2 in Switzerland and presented ABB as its main technology partner. Now there are more than 40 similar fast-charging stations, helping electromobility to make rapid inroads in Switzerland. IONITY aims to establish a network of about 400 fast-charging stations in 24 countries by the end of 2020.

Electrify America is pursuing similarly ambitious plans with the biggest electric vehicle

infrastructure project to date in the US. The company plans to place hundreds of charging stations in and around 17 metropolitan areas and along numerous nationwide highway corridors – and ABB is one of the preferred suppliers with the Terra HP.

In addition to these public networks, charging stations are also being set up by the car manufacturers themselves. Porsche, for example, is planning to install its own charging infrastructure for its electric customers. ABB will be helping to get this off the ground in Japan. According to a contract signed in April 2019, Porsche Japan will install ABB high-speed charging points in Porsche centers and public facilities throughout the country. The two companies are also aiming to join forces to develop the next generation of charging devices.

These will not only benefit the 30,000 or so customers who signed up for a Taycan before the market launch, but also the purchasers of future electric models. Porsche has imminent

plans to launch the Cross Turismo, an estate variant of the Taycan, and to offer the next-generation Macan in an all-electric variant from 2022.

Before that, however, Porsche will present another model – one not built for normal road use. A Porsche team will join the lineup in 2019/20 for the sixth season of the ABB FIA Formula E Championship, the world’s only all-electric race series.

This is ABB’s third season as the title partner of the series, which serves as an important development platform for the future of sustainable transport. And it is not completely new ground for Porsche either: the public was able to see the new Taycan for the first time at the final race of the last season in New York.



THE SEVEN WONDERS OF THE SUSTAINABLE WORLD

This record-breaking building has proven to be a true environmental pioneer, thanks to its energy-efficient power supply with 11 kV high voltage converted to 230 V mains voltage in the world's highest electrical substation on the 155th floor, and 50 space-saving gas-insulated switchgears that ensure precise power transmission and supply energy-efficient power to the Dubai Fountain, the world's largest water fountain.

BURJ KHALIFA

Opened: 2010
Height: 829.8 m
Number of floors: 189
Cost: USD 2 billion

THE WORLD'S TALLEST BUILDING. ENERGY EFFICIENT, THANKS TO ABB.



From the parabolic troughs that collect and concentrate heat, to the heat transfer system that moves thermal energy to molten salt storage tanks, to the block-unit power station where electricity is generated and fed into the grid: the ABB Ability™ Symphony® Plus Distributed Control System (DCS) is the brain of the plant, controlling and managing all the processes in a single, user-friendly system.

GANSU DUNHUANG SOLAR PARK

Location: Gobi Desert

Opened: December 2018

Output: 100 MW

Annual coal saving: 90,000 metric tons

THE WORLD'S BIGGEST MOLTEN SALT SOLAR PLANT. WITH ABB BRAIN POWER.



NEW ORLEANS, THE BIG EASY. PROTECTED FROM FLOODING BY ABB.

With a total of 67,500 hp, 17 ABB vertical gear motors (VGM) drive the massive pumps supplied by Patterson Pump Co. These pumps move up to 42 million liters per minute and could drain an Olympic-sized swimming pool in just four seconds. Seven ABB medium voltage drives guarantee maximum performance without delay even with a cold start, saving precious time when responding to catastrophic flooding.

NEW ORLEANS METROPOLITAN AREA

Population: 1,268,883

State: Louisiana

Birthplace of jazz

August 29, 2005: Hurricane Katrina flooded 80% of the city.



THE WORLD'S STEEPEST FUNICULAR. DOUBLE THE CAPACITY, THANKS TO ABB.

Two custom-made high-performance ABB motors make the new Stoosbahn in the Swiss canton of Schwyz twice as fast as its predecessor. Its energy-efficient performance ensures a more sustainable environmental balance.

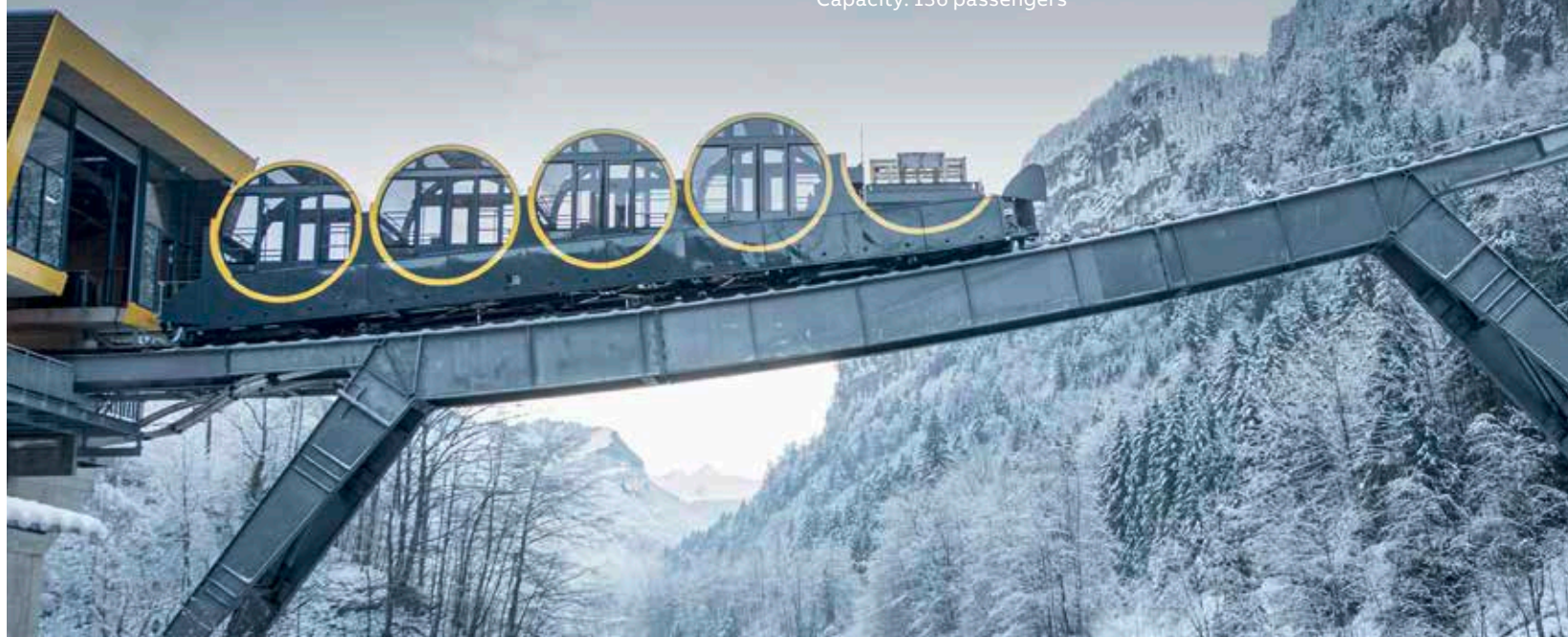
STOOSBAHN

Opened: December 17, 2017

Length: 1,700 m

Max. gradient: 110%

Capacity: 136 passengers



With ABB's Azipod propulsion system, 360° swiveling propeller pods are mounted under the ship's hull, enabling effective and efficient maneuvering in harbors or on challenging routes. Azipod is now considered the industry standard in the cruise segment, with an impressive availability rate of 99.8% and a reduction in energy consumption of up to 15% compared with traditional shaft drive systems.

VIRGIN VOYAGES CRUISE LINE

Length: 278 m

Width: 38 m

Capacity: 2,700 passengers
and 1,150 crew

FORWARD-LOOKING LUXURY CRUISE LINES. 15% LESS ENERGY CONSUMPTION.



Driven by energy-efficient, precisely calibrated ABB motors and control systems, the retractable domed roof opens at a rate of 40 mm per second. It takes only about 20 minutes to fully open or close the roof. ABB Programmable Logic Controllers (PLC) control and coordinate 32 regenerative variable speed drives that convert braking energy into drive energy.

NATIONAL STADIUM OF SINGAPORE

Capacity: 55,000 spectators
Dome area: 20,000 m²
Dome height: 80 m
Dome diameter: 312 m

**THE WORLD'S
LARGEST
FREE-SPANNING
DOMED ROOF.
PRECISE, EFFICIENT
MOVEMENT,
THANKS TO ABB.**



**THE WORLD'S
BIGGEST BATTERY.
RELIABLE ENERGY
SUPPLY TO REMOTE
REGIONS,
THANKS TO ABB.**

ABB technology provides power to the most secluded corners of Alaska. The battery energy storage project, installed in Fairbanks in 2003, remains the oldest and most powerful in operation globally today. The battery of 13,760 massive nickel-cadmium cells is bigger than a football stadium and made the Guinness World Records in 2005. In conjunction with ABB's power conversion modules and measurement, protection, control and service equipment, it provides 32,000 customers with continuous power. This backup power supply has ensured up to 80 fewer blackouts annually.

ALASKA

Capital: Juneau
Population: 737,438
Area: 1,717,854 km² (largest US state)
Winter temperatures: down to -51°C



Lord Norman Foster

From postmodern architect to visionary urban planner

Norman Foster made a name for himself through his impressive, ambitious buildings. Since the 1970s, the star architect and his firm, Foster + Partners, have designed some of the world's most iconic postmodern structures. Recently, however, Foster has become increasingly known as a proponent of sustainable city planning. Masdar City in Abu Dhabi is just one example of how Foster takes a sustainable approach to our planet's future.

Text: **Michael Kathe**



Lord Norman Foster


The British architect and city planner Norman Foster studied at the University of Manchester and Yale School of Art and Architecture. Some of his best-known buildings include London's Millennium Bridge, 30 St. Mary Axe (the Gherkin) and the Reichstag in Berlin. Foster has won countless awards for his designs. He played a central role in the development of Masdar City, one of the most sustainable places on earth, as the project's lead city planner.

The accessible glass dome atop the Reichstag building in Berlin, the Swiss Re tower, known as the Gherkin, in London, the Clyde Auditorium in Glasgow – Lord Norman Foster is known around the world for these and other landmark buildings. He and his firm have won many major awards, including the German Sustainability Award for their pioneering work in sustainable architecture and design.

In 2007, Foster presented his “Green Agenda for Architecture” – before Greta Thunberg had even started school. He outlined the possibilities of improvement to people's quality of life, despite a growing global population and increasing urbanization. It was and is no longer just about individual buildings, but about urban development projects that must be considered holistically – regardless of whether a city is to be rebuilt or further developed.

New developments, however, remain his best-known projects. Cities that are planned and built from the ground up to meet the needs of people and nature. First is Masdar City (see article), its design is based on Foster's idea of anticipating the problems of future generations and holistically considering the requirements of mobility, water supply and, most importantly, climate compatibility. Foster describes construction of new infrastructure as “the urban glue that binds buildings together” and which must be adapted to culture, society and the population.

In his view, the key to creation of the sustainable cities of the future is interdisciplinary architecture. From the start, city planners should work with specialists from other areas to solve increasingly complex problems. This is the only way to improve people's quality of life in cities, while also achieving a greener, more sustainable future.

Foster + Partners is moving toward achieving this goal with its master plan for the Indian city of Amaravati. With 60% of its area devoted to public green spaces, the city will be transformed into a natural haven enhanced with the latest technology and restructured around strategically placed lakes and canals, roads for electric cars and shaded walking paths. Norman Foster notes that he has managed to integrate cutting-edge technology into his research on sustainable cities – work that spans three decades. If the city is completed according to plan, Amaravati should become a model city for the future. 

Masdar City

A master plan in efficiency

The world's most sustainable city is located in the desert: Masdar City is an experiment designed to explore human civilization after the age of fossil fuels. The city uses a quarter of the energy of comparable cities by combining ancient wisdom with today's newest technology.

Text: **Peter Sennhauser**

The images seem to be from science fiction: a commercial center with a plaza full of giant sun umbrellas that open hydraulically every morning, residential areas with three-story houses equipped with solar panels and in between – in a green belt with watercourses – semi-transparent domes where vegetables are grown at temperatures of about 20°C. And in the desert along the Persian Gulf, no less.

Masdar – Arabic for “the source” – is a six square mile experiment just outside Abu Dhabi, capital of the United Arab Emirates. Often mentioned in the same breath as Songdo – the major “smart city” project near Seoul, Korea – Masdar focuses more on efficiency and ecological sustainability than networking and automating its entire infrastructure.

By 2030, with a development budget of USD 22 billion, Masdar will be a livable, mixed-use city of 50,000 residents, 1,500 businesses, and thousands of jobs that are almost energy-autonomous and carbon-neutral.

To achieve this, the British star architect Lord Norman Foster and his firm have developed a master plan that relies on both ancient wisdom and cutting-edge technology. Examples include modern, solar-powered seawater desalination plants for drinking water supply and the massive “wind tower” at the heart of the city: these catch the natural airflow high above the rooftops and send a cooling breeze into the streets below. This centuries-old trick derived from Persian architecture lowers the felt temperature on the streets of Masdar by 10 to 15 degrees, compared with neighboring Abu Dhabi.

Masdar City's entire infrastructure is designed for sustainability. Nevertheless, fasci-

nating architecture can still be found in individual buildings and sectors – a prerequisite for a star such as Norman Foster. Experience has taught him that infrastructure is “the urban glue that binds buildings together”. More important than design details, he argues, is “the overall picture: the master plan”.

This plan represents a watershed. By combining clever architecture with technological innovations, such as the enormous solar-powered sun umbrellas shading the plaza, Masdar residents can move comfortably around the city by foot, bicycle or autonomous electric shuttle, even in summer. No building is more than 200 m from public transport services, which provide quick metro

“At just three tons of CO₂, Masdar residents have a carbon footprint of about half the average of comparable cities.”

or tram connections to downtown Abu Dhabi or the nearby international airport.

Gas-powered vehicles are prohibited in residential areas and restricted to strategically placed car parks on the periphery of residential and commercial zones. Huge rows of solar panels provide shade for the vehicles parked here. The panels are part of a 10 MW solar project that – together with wind turbines in the desert outside the city – provide Masdar with electricity. Electric vehicle charging stations are located around the city.

Even residents who commute to work have a positive carbon footprint: “At just three metric tons of CO₂, Masdar residents have a carbon footprint of about half the average of comparable cities,” explains Karim El-Jisr, Director of the Sustainable City Innovation Center.

Unlike the energy consumption at other latitudes, where transport and heating contribute significantly to carbon emissions, in the UAE the primary concern is air conditioning. Masdar City architecture is fundamentally shaped by this concern. All residential buildings are constructed facing north, away from the sun, and kept cool with UV-reflective cladding. Meanwhile, the 11 urban farming domes are equipped with a simple air conditioning system: large fans – powered by the car parks' solar panels – create low pressure inside the greenhouses. As a result, exterior air is sucked in through thin, moist membranes in the dome and cooled by the evaporation process.

The water is the same as that running in the stream beside the domes: it's gray water, wastewater from showers, dishwashers and washing machines processed in quiet, odor-free underground facilities. Back above ground, papyrus – an effective biofilter that adds green to the riverbanks – handles the next stage of treatment. The other planting along the waterway has been selected for ornament and utility: date, avocado and pomegranate trees have been planted here, their fruit harvested and sold. The city's garbage is processed in an internal circuit – communal garbage and recycling collection facilities serve clusters of 10 housing units.

Maintenance of all these facilities naturally costs money. “Sustainability,” El-Jisr reminds



Energy-autonomous and carbon-neutral, thanks to centuries-old ideas and the latest technology: Masdar City.

us, “is not just a question of energy and ecological balance: the economic dimension is just as important.” For that reason, the operating company has designated an entire business complex for rental, with the revenue to be used exclusively for facility maintenance and administration. Home-owners are exempt from any taxes or fees for municipal upkeep.

Building Masdar’s infrastructure is not inherently more expensive than in any conventional city. “Sustainability is expensive when it’s retrofitted,” El-Jisr explains. “Not when you plan it systematically and integrate cutting-edge technology from the start. The proof is right here in Masdar.”



Dalith Steiger

On course for a sustainable future with artificial intelligence

Many people view artificial intelligence as something unknown, intangible or even unsettling, although hardly any area of life is exempt today. We spoke to Dalith Steiger, a leading expert in AI, about the latest developments in the field and how this technology will change mobility and other aspects of life.

Interview: **Reiner Schönrock**

As the computer scientist John McCarthy posited in 1956, “every aspect ... of intelligence can in principle be so precisely described that a machine can be made to simulate it”.

Indeed, only 30 years after this fundamental principle of artificial intelligence (AI) was formulated, the first chess computers shocked the world. Today, another 30 years later, we tell our car where to go, dictate pages of correspondence to a word processing program and complain to a computer-generated hot-line assistant.

These systems translate human speech into binary code and, if desired, back again – into any language. This allows the Bulgarian

taxi driver to understand where the German tourist in the backseat would like to go.

Such tremendous computing power is contained within a handy smartphone that can also capture high definition photos, stream movies and shows from vast libraries, and enable instantaneous international video conferencing. Today, nearly every other person on the planet has access to the mostly free services of this “mobile intelligence”.

During a train journey along Lake Zurich, we talked to Dalith Steiger, co-founder of the award-winning organization SwissCognitive – The Global AI Hub (www.swisscognitive.ch). Steiger is one of the world’s leading influ-

encers in the area of AI and was recently named a Top 100 Digital Shaper by Bilanz magazine.

SwissCognitive has more than 400,000 followers on social media, where it posts updates on the latest developments in AI.

As an expert in the field, Steiger is convinced AI will change almost every aspect of our lives. Since the conversation took place on a train, the topic of mobility soon came up.

Steiger: “The world grows more complex every day. Tremendous strain is being put on infrastructure, tech is engaged in a constant race with itself, climate change is forcing us to rethink our ways and many societal norms are changing. These factors demand and facilitate new solutions to practices that for centuries were ‘just the way we do things’. The way we approach mobility, for instance, will change dramatically. Change will soon be the constant among topics such as electromobility, the sharing economy, traffic density and smart cities.”

Experts agree that in the long term the gradual introduction of AI is the only way to ensure the widespread breakthrough of pioneering options such as electromobility. AI allows communication between mobile and fixed elements in the value-added chain, a critical component in making these processes truly practical. When a motorist drains the battery in their electric car after 400 km, they don’t want to wait two hours for a charging station to become available – they want to dock immediately at a station that has anticipated their arrival. ABB charging stations, which are managed and maintained on a remote network, collect the necessary data. In the near future, AI solutions could make this network more robust to meet wider demand.



Leading influencer Dalith Steiger: “Artificial intelligence will change every area of our lives.”



Steiger: "Change will soon be the constant in mobility."

What else is AI changing in mobility?

Will we soon be driving remote-controlled, autonomous vehicles?

That's doubtful, says Steiger: "People like to think in extremes, and many are already imagining an age without drivers. At Swiss-Cognitive, we believe that priority will be given to environmental work and managing freeway capacity. It makes more economic and ecological sense to increase use on some sections of the highway than to spend lots of money on expanding them. Preferably, this would be accomplished by gradually introducing semi-autonomous trucks or even passenger vehicles. These projects are not intended to force out drivers; instead, the goal is to increase infrastructural capacity. This approach could also be applied to rail and air travel."

Although semi-autonomous cars, buses and trucks could be on the road in the foreseeable future, there is a lot human drivers can do that these vehicles cannot: they cannot care for, maintain or repair themselves – a flat tire will literally throw them off course.

The entire process – from design to manufacture to distribution – will present challenges to even the most advanced systems for a long time to come. In short, for the time being AI-supported systems can manage clearly

defined autonomous tasks – no more, no less.

Steiger: "We refer to systems today as 'narrow AI'. They can handle only a single problem at a time. These systems still struggle to solve more complex problems, such as those in which moving images, written text and spoken language must be analyzed and recognized in context."

At ABB Future Labs, however, technology for the AI-based factories of the future is already being developed. Eventually, autonomous industry systems will not only be able to compile and analyze data from different sources, but reach independent conclusions based on that information. They will thus be in a position to make correct decisions, even in situations they have not been programmed to handle.

ABB has already taken the first steps towards this future; for instance, recently an unmanned ferry was directed through Helsinki harbor by remote control. In the autonomous shipping of the future, a single captain could monitor several such ships from land, intervening only when necessary.

More than 1,000 ships and their technical components are already monitored by the nine ABB Ability Collaboration Operations Centers around the globe. This allows companies to anticipate maintenance requirements

and have the necessary replacement parts ready when the ship comes into port. It also enables route optimization, which benefits the environment by lowering energy use and CO₂ emissions, improves passenger comfort and protects cargo.

Steiger on the environmental aspects of AI:

"Today, we are facing a growing need to use resources more effectively. This, coupled with the abundance of data collected by the Internet of Things (IoT), is opening a host of new possibilities for AI. Smart technology represents a real chance to attain the UN's Sustainable Development Goals by its proposed deadline. This applies to education, the distribution of critical medicines and human rights as much as it does to fighting climate change."

Furthermore: "To take advantage of these opportunities, however, society needs to be open to new approaches. Regulators, like the rest of us, have not always kept an eye on big advances in technology. What we're asking of regulators in finance, communications, aviation, pharmaceuticals or transportation is to allow us greater leeway in developing new ideas. We are a country of doers, and doers need space to test the viability of their investments. Test first, regulate second – that should be the rule."

When asked how suited Switzerland is to this kind of work, Steiger replies:

“The conditions in Switzerland are ideal. AI will be at home here for a long time to come. The country has no natural resources, but in its long history has repeatedly reinvented itself and built up worldwide trust in the Swiss brand. We have what it takes to become an important voice in the global AI race. Our universities, experts, start-ups and global corporate AI labs – they all contribute to a small but powerful AI ecosystem. There’s much room for further development. And we should engage in active, international dialog about what has already been achieved.

That’s exactly what we’re doing with Swiss-Cognitive’s first spin-off. CognitiveValley is a non-profit movement to position Switzerland around the world as ‘AI Nation Switzerland’. We launched in September 2019 at EPFL in Lausanne.”

How will AI impact each of us?

Steiger: “We believe that smart technology will enable us to maintain our prosperity. The bandwidth, computing capacity, algorithms and vast amounts of data we have at our disposal today allow us to support the changes taking place, and to prioritize responsible action for our future.

We believe that cognitive technology is part of a massive shift. The development may be irreversible, but we can control it. We must tap into this new technology. It should not be used against us, but for us.”

What time frame are we talking about?

Steiger: “The changes enabled by AI won’t emerge overnight. Companies, institutions and administrative bodies have to learn how to manage new demands on talent, data, technology and leadership. Far more is technically possible today than is actually practiced, but we have to start first with what we allow in our daily lives. Many projects today are still in the laboratory phase. Depending on the industry, this can and will change overnight in some cases.

As individuals or companies, and as a country, we can prepare by gaining valuable experience and establish the legal framework for the smooth introduction of AI technology.

Socio-politically speaking, we must not underestimate the need for dialog. AI sparks fear, and many people wonder: what will


happen to my identity – my data – and will I even have a job in the future?

Beyond understanding the basic principles, we need to understand these processes as they apply to our lives and values. It is therefore our task in coming years to introduce AI to the public. A failure to familiarize people with AI could impede its growth.

AI is like any other technology. It will change society and individual behavior in many areas. It will help us in healthcare and hotel reservations, increase efficiency in production processes and optimize mobility. Certain tasks will disappear, job descriptions will change and entire industries will emerge or vanish. These changes will make demands of us as individuals and as a society. Stasis is not an option. Environmental and demographic developments simply pose too great a challenge.

Today, the rate of change is no longer measured in generations, but in years – a new reality that requires a new mindset. People’s control over themselves is growing alongside technology. The new system must earn their acceptance.”

This could also be helped by advances that have received too little attention in the AI debate, which so far has often focused on the negative effects. For instance, AI can help visually impaired people experience the world with greater independence. “Seeing AI”, a tool developed by Saqib Shaikh, a Microsoft engineer who lost his eyesight at the age of seven, can read symbols and documents, identify currency and products, recognize friends and even interpret their facial expressions.

Steiger: “Mobile apps such as these are hugely significant to the users concerned. AI can open new opportunities in everyday life for the blind, deaf and physically impaired. As the short film “The Child of Earth” poignantly illustrates, a terminally ill person can travel into space using a virtual reality (VR) headset and experience a new quality of life. AI is more than a tool for optimizing efficiency. When properly applied, it can also inspire an emotional, artistic response. 



“Artificial intelligence offers us the opportunity to maintain our prosperity.”

Alexander Mankowsky

Outlook 2050: Human First!

As we look towards 2050, the notion of putting humans first is gaining greater urgency. First, we must build a path out of our digital present day and into a more physical, human future. Second, we must respond to the challenges of climate change with industrial force. These topics are connected in their relevance to our future.

Alexander Mankowsky

Born in Berlin in 1957, Alexander Mankowsky studied sociology, philosophy and psychology at FU-Berlin, later adding artificial intelligence and engineering to his studies. He was a case worker for at-risk children and adolescents, knowledge engineer for expert systems in LISP and Prolog, and trend researcher, before becoming the in-house futurologist – some might even say mobility philosopher – at Daimler. He serves on the jury of the EU's STARTS Prize, awarded to projects that integrate art and innovation, and is a co-founder of future.io, the European Institute for Exponential Technologies & Desirable Futures. Daimler Future Talks and "Future Insight: Human First. Empathy as anchor in the digital transformation" can be viewed at media.daimler.com. Developing idealistic but actionable visions for the future is Mankowsky's calling.



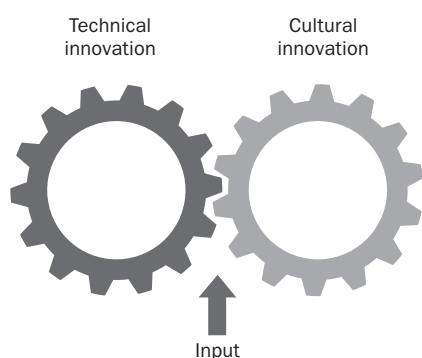
Alexander Mankowsky, futurologist at Daimler AG.

The world opened its doors in 1989, with the fall of the Berlin Wall and creation of the World Wide Web. In 1994, Amazon was launched, followed in 1998 by Google and a year later by Alibaba in China.

By 1999, I could order movies – and finally books! – in their original language from the US. The first book I bought was almost impossible to find in Germany: “Design Paradigms – Case Histories of Error and Judgment in Engineering”, by Henry Petroski.

The world was suddenly open and transformation was inevitable: the engine behind the ensuing changes was tech – the digital revolution. The social disruption that followed the fall of the Iron Curtain and Deng Xiaoping’s opening of China to the world in 1978 certainly played a critical role, but without email and the internet, globalization as we know it would never have happened.

The technical and socio-cultural movements occurred almost simultaneously. If you picture these two drivers as interlocking cogs, you could say they ran “like a well-oiled machine”.



It may seem that these “cogs” spin of their own accord, but in practice we are the ones – whether as individuals or global corporations – that spark their movement with our input.

From digital high to digital hangover

With his seminal book, “The Singularity is Near”, published in 2005, Ray Kurzweil was elevated to the status of tech evangelist and digital transformation soothsayer. By 2045, he predicted, AI would possess the wherewithal to program itself and leave humanity behind. We would upload our consciousness to the AI cloud, but otherwise cease to exist in our present-day form.

However, despite the billions that have been invested in AI and machine learning, today’s machines are still not capable of self-programming. In fact, the very opposite

is true: programmers have never been in such high demand.

AI experts no longer expect that kind of breakthrough or miraculous awakening. For instance, a lot of hardworking engineers are still needed to ensure that self-driving cars are able to function safely. And we’re still miles away from vehicles capable of independent learning on the road without any human support.

Amazon’s Alexa represents state-of-the-art digital technology today. In their artwork “Anatomy of an AI”, Kate Crawford and Vladan Joler illustrate the interdependencies of this digital program in a detailed map. It depicts the complex socio-technical system Alexa uses – not unlike a medium – to connect humans and data. In the background – and invisible to the users who, with their input, are also producers of the system – Alexa’s responses are continuously edited by thousands of “ghost workers.”

Any AI system that cannot be strictly parameterized will function in similar fashion: it “lives” through permanent human contribution. Viewed in this light, digital transformation has sparked a much bigger conversation that we, as a species, must have with ourselves.

Perspective 2050

Following the initial digital high, the “cogs” mentioned earlier have swapped roles. The main driving force is no longer tech, but cultural and societal factors. In the avant-garde arts scene, where digital has long since lost its edge, this turn toward biological art – indeed, towards life – has been gaining traction for several years. Plenty of examples can be found in the submissions to the STARTS Prize, granted annually by the EU in cooperation with Ars Electronica.

The reversal can also be seen in popular efforts to move big digital corporations out of the libertarian tech world and into the normal economic realm, where regulations are upheld, taxes are paid and monopolies are dissolved.

The cultural “cog” is largely powered by climate concerns these days, increasing the relevance to industry as well. Technical solutions must be found, not only to prevent CO₂ emissions, but to extract them from the atmosphere. The window for action, meanwhile, has diminished to a single lifetime. Statistically speaking, every third girl born today (and

every 10th boy) will live to be 100 – meaning they will experience the consequences of our actions firsthand.

The faces of change are those of Greta Thunberg in Europe and Congresswoman Alexandria Ocasio-Cortez in the US. Ocasio-Cortez has proposed a Green New Deal, modeled after Franklin D. Roosevelt’s New Deal of 1933–1936. This federal program, launched in response to the stock market crash of 1929, allowed the US to fight some of the worst effects of the Great Depression by building critical infrastructure, including the Hoover Dam in Nevada.

Similarly, the Green New Deal aims to rebuild infrastructure and industry. Purely market-based incentives are no longer considered sufficient. Interestingly, the financing model does not rely on taxes, but instead follows Modern Monetary Theory (MMT), which states that the money needed can simply be printed, as long as sustainable value is generated. This certainly seems more reasonable than current central bank practices, where money is constantly being created that has no concrete value.

Industry tasks and opportunities

In terms of investment, a program such as the Green New Deal is both meaningful and secure. However, neither politicians nor citizens or climate researchers can contribute technically realistic solutions to the climate crisis.

This task – this opportunity – is reserved for industry. The first step is to industrialize the concepts and prototypes for CO₂ avoidance and removal that exist in development departments and start-ups. Only then can politicians propose plans and submit them to the electorate for approval.

In considering our perspectives for 2050, cultural and societal issues will be the driving forces, technology merely representing the means to an end. We don’t need a miracle. On the contrary, what we need is to use the resources that already exist.

The motto for this era: humans first! This shapes our thinking and behavior as the focus shifts to humans as an integral part of nature.



Professor Günther Schuh

Vision of electromobility 2030

What will our cities look like in the near future? How will people get around? How will goods be transported? We spoke to Professor Günther Schuh about his vision for electromobility, the key technology for the transit of the future.

Text: **Klaudia Kunze**



Professor Günther Schuh

Günther Schuh is a multi-talented multi-tasker: he is a professor of production engineering at the renowned RWTH Aachen University in Germany. As managing director of RWTH Aachen Campus, he is driving the development of an ecosystem that merges science and business. He is also a businessman and serial start-up founder behind such projects as the electric vehicle manufacturer StreetScooter and e.Go Mobile. Schuh is also CFO of e.SAT, founded in 2018, which is developing the small hybrid-electric aircraft Silent Air Taxi. He's a visionary and, as he says, implementer of innovative projects. Schuh is ever on the lookout for pragmatic solutions.

Günther Schuh has been a household name in the e-mobility scene since 2010, when he founded the start-up StreetScooter at RWTH Aachen with the aim of developing an affordable electric vehicle for short distances. Deutsche Post acquired the company in 2014 – it needed an electric vehicle for deliveries – and since then has put more than 9,000 StreetScooters on the road.

The next step came in 2017. This scientist and businessman introduced an affordable electric car for city driving, and two years later followed up with a small electric plane for use as an air taxi. Schuh's vision is clear: he is not driven by individual projects alone, but by an underlying, holistic approach to mobility for the future. And even that is too short-sighted. Ultimately, Schuh states, mobility is merely an ideal 'proof point' that reveals the challenges and opportunities presented by growing digitization and the interconnection of all aspects of our lives.

Two steps forward, no steps back

What will our cities look like by 2030? And what forms will mobility take? These questions apply to society, politics, cities, communities and not least industry. One thing is certain: we are tasked with re-envisioning the mobility of tomorrow.

In big cities today, there is an average of one car for every two residents. Growing populations mean a growing risk of cataclysmic effects on urban traffic patterns. This is coupled with increased CO₂ and NO_x emissions and fine particulate matter on city streets.

Authorities are currently responding primarily with regulations – that is, with driving bans, exclusion zones and additional fees for city residents and visitors.

Although many predict or are at least calling for an end to privately owned passenger vehicles, Schuh believes it's possible to take two steps forward, no steps back. He sees mobility as one of the greatest social accomplishments of all time – and in this vision, the automobile is not the problem, but part of the solution. As part of a master plan that offers city residents a wide range of flexible, intelligent and emission-free transport options, cars will still feature as a means for individuals to navigate the roads of the future.

The first step toward accomplishing this vision for 2030 is to reduce pollutants in city centers. Schuh argues that we need small, agile electric vehicles that the majority of people can afford without major subsidies. "For driving short distances in the city, an electric car with a small battery is currently the most logical solution, both ecologically and economically," contends the professor in production engineering. At the same time, he qualifies this statement: "This approach lowers harmful emissions in our cities, but does not reduce the risk of increased traffic congestion."

The second step therefore focuses on an expansion of local public transport options, with fleets of electric (and ultimately self-driving) mini-buses and shuttles. This would concentrate traffic and allow cities to use existing public infrastructure to the fullest, until large electric buses become more affordable. That might take a while: Schuh does not expect battery prices to drop significantly in the near future. The generation-after-next of large batteries (>60 kWh), available in about 15 years, will be the first that will be affordable enough to make their installation economically viable.



A vision for 2030: mobility hubs connect the old with the new

Digitization: danger or opportunity?


Schuh reminds us that for all these steps, we must not disregard the impact of growing digitization. The commerce sector was the first to experience the sometimes disruptive nature of digitization. Initially, only booksellers were harmed by online retailer Amazon, but the company gradually added consumer goods, electronic devices and now even groceries to its available products. “The heart of change resides in scaling, which is made possible through platforms,” Schuh explains in his conversation with “persönlich”. “Using a platform, I can suddenly offer a range of products from different segments and no longer need to limit myself to, say, books.”

Conversely, digitization also offers an array of new possibilities. “Now it’s mobility’s turn,” says Schuh and points out that new technologies have already changed today’s mobility sector and enabled existing mobility concepts to be adapted.

But Schuh’s ideas go even further. In order to bundle personal transport options, he envisions mobility hubs on busy main roads that allow commuters to transfer from conven-

tional vehicles to environmentally friendly alternatives, such as small electric cars, self-driving electric buses or even e-scooters and e-bikes. Taking it yet another step further, these mobility hubs could eventually offer air taxi services in quiet, electric mini-planes. To accomplish this, a widespread, fully digitized charging infrastructure must be designed and built with the same attention to needs-based practicability as today’s gas stations.

In urban centers, these hubs – connected to and interfaced with a digital app – could make electric sharing fleets available to defined user groups for everyday service. Not only would this lower mobility costs for individuals, it would drastically reduce the number of vehicles on the road in urban centers.

Overall, Schuh’s vision for 2030 is optimistic: he is convinced that by establishing electromobility as a key technology and achieving full digitization, we can secure individual mobility – currently threatened by driving bans and exclusion zones – while reducing air pollution and daily traffic congestion in our cities. 

Digitization drives sustainability

Schuh considers digitization the key driving force behind sustainability. Digitization optimizes industrial overproduction and underuse of resources, and ensures needs-based assets are made available on demand, regardless of when and where. Digital images are an important tool in his toolbox: realistic digital images of physical assets – whether products, systems or factories – can help reduce development, production and trial time, as well as the cost of prototyping and ramping up of production. Consistent data is a prerequisite for successful introduction of this technology. The data must be supplied by a single source of truth (SSOT) throughout the asset’s life cycle and supplemented by specific domain knowledge.

ABB Chairman and CEO Peter Voser

Racing for the future

The ABB Formula E Championship is the fastest growing motorsport event in the world. The technological advances that ABB and its partners have pioneered pave the way for sustainable solutions on the road and prove that we can look towards the future with optimism.

The ABB FIA Formula E Championship has a little something for everyone. For racing fans, it is the first all-electric FIA motorsport series in the world. For the general public, the races – which are held on spectacular city courses – provide weekend entertainment and a peek into the future of mobility. And for technology groups such as ABB, ABB Formula E offers the unique opportunity to develop digital and other electromobility technologies and test them on the racecourse – for future use in sustainable transport solutions on the road.

The races also provide us with a fantastic platform for talking to clients, resulting in closer cooperation and more fruitful partnerships. Last but not least, ABB Formula E has significant influence on political decision makers, most of whom are keen to exploit the potential of electromobility and digitization.

The ABB FIA Formula E Championship is most important, however, for young people.

The series was conceived with the aim of mobilizing people and technological developments for a sustainable future. And with the sixth season, we can confidently say we have attained our goal.

ABB Formula E is not only the fastest growing motorsport event in the world, it also features the most rapid advances in technology: the all-electric Gen2 race car introduced last season can reach up to 280 km/h and accelerates from zero to 100 km/h in just 2.8 seconds. Its reach has expanded too: the new battery capacity is nearly double that of earlier models and when fully charged will last the length of an entire race.

Charging technology is improving just as quickly. Just a few years ago, car buyers were still reluctant to switch to electric vehicles, since they took a long time to charge and charging stations were few and far between, unlike conventional gas stations. Today, ABB's Terra line of high-performance stations can deliver enough power for 200 km in just eight minutes. At the last count, we had sold more than 11,500 of these fast-charging stations in 77 countries. It's no wonder that electric car

sales have skyrocketed. Our OppCharge system for public transport ensures that electric buses get a quick energy boost at selected stops or terminals, keeping them on the road for passengers all day.

Overall, ABB Formula E represents the optimism with which we look to the future. To meet the challenges of climate change, we must do more than simply point fingers and wait for others to take action. Instead, we must join together in developing solutions and technology that allow everyone to enjoy a decent standard of living, without destroying the environment. We inherited a world with clean air, temperate climates and oceans rich in biodiversity. It is our responsibility to leave behind as healthy a planet for future generations as the one we were given. 