47 · 11/2024

tec news

HARTING's Technology Magazine

IT'S ELECTRIC, IT'S FANTASTIC

Why the All Electric Society (AES) inspires us

THE PATH TO THE AES: ENDURANCE INSTEAD OF SPRINTING!

Gunther Koschnick, ZVEI

CONNECTORS AND CABLES: A PERFECT MATCH

Norbert Gemmeke and Jörg Scheer, HARTING

STANDARD AHEAD: DATA LEADS POWER

Ralf Klein, HARTING

editorial

We need to act NOW – with connectivity!

FOR A BETTER WORLD

Dear readers,

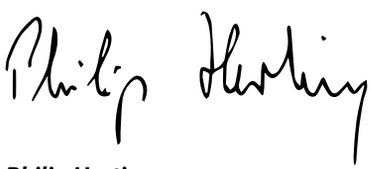
The eye-catching layout of our cover page may remind you of the Oscar-winning film "Barbie", which made quite a splash this year. But what does this flashy blockbuster have to do with the All Electric Society? It is the basic idea that unites the two: The world we live in must be re-examined and rethought in order to change for the better. What Barbie is all about when it comes to combating stereotypes, the AES is about consistently realising a vision that for me no longer feels like a vision. Haven't we already been living in an "electric society" quite some time now - with our smart phones, robot vacuum cleaners and lawn mowers, dishwashers and washing machines? So what is it that makes our "Electric Society" an "**All** Electric Society"? How big is the step to reach this "All" of the "All Electric Society"?

For us, the "All" is the world of the future, which is characterised by universal connectivity between all assets in all sectors. Each and every asset will be interconnected, interacting and building an intelligent, CO2-neutral and efficient future system. We, the HARTING Technology Group, are offering everything that creates the connection - networked with our connectivity.

And here we already have salient examples for the crucial lifelines of power and data. Here, we are already putting down the foundations of the All Electric Society.

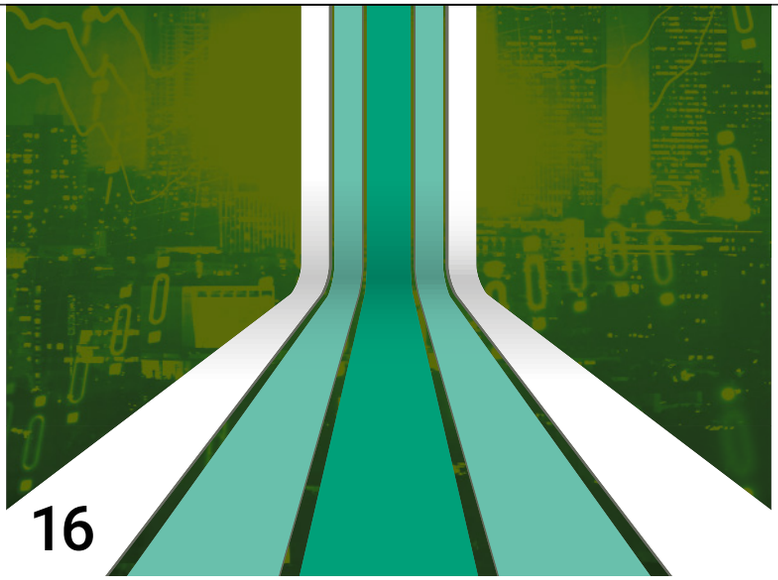
Be sure to help us in realising the "All" of the AES as speedily and comprehensively as possible.

We hope you enjoy reading the latest issue of our tec.news.



Philip Harting
Chairman of the Board,
HARTING Technology Group

tec news
Das Technologiemagazin von
HARTING
Pushing Performance
Since 1945



Satisfying the hunger for energy electrified and networked

The framework conditions demand a clear step in the direction of renewable energy

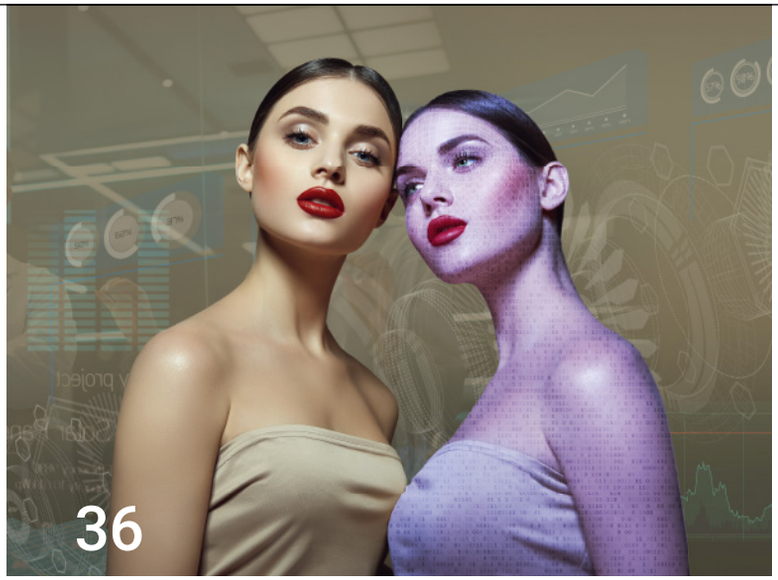
The path to the AES: The long-distance race is on!

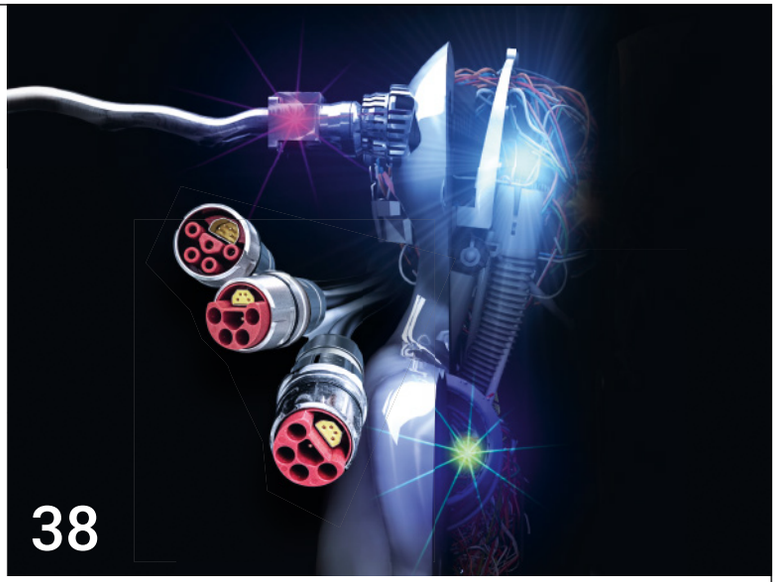
Gunther Koschnick, ZVEI

Issue 47 I Cover story:

CONNECTING THE ALL ELECTRIC SOCIETY

future technologies





Standards for digital twins

Detlef Tenhagen, HARTING Technology Group, on the question: What makes a digital twin successful?

One interface for all lifelines

Hybrid interfaces from the One Cable Automation Initiative

A rewarding connection: the tec.news world on the web

Delve deeper into topics with articles, multimedia content and lots of inspiration: Visit us online too!

HARTING.com/ tecnews

strategy

collaboration & co-creation

customer benefits

CONNECTING THE ALL ELECTRIC SOCIETY

For HARTING, the All Electric Society (AES) is the key element in charting the course to a sustainable world. But achieving this will also call for interlinking the sectors. And there is a foundation for this complex task that needs to be outlined and established.

Dr. Stephan Middelkamp
General Manager Quality & Technologies, HARTING Stiftung & Co. KG

Sector coupling and the associated comprehensive electrification also leads to more intelligent, controllable and therefore to electrical consumers, which also save energy.

The AES could hardly be more ambitious: It perceives itself as the solution to the problem of energy supply for mankind - in other words, the perpetual motion machine in its most extensive form. The concept is not only intended to cover current needs, but also take future energy requirements into account.

One of the UN Sustainable Development Goals (SDGs) is to provide people around the world with access to energy. If we look specifically at electricity, around 759 million people, or 10 per cent of the world's population, were living without access to it in 2021 alone. What's more, there are hundreds of millions of people who have only limited or unreliable access to electricity.

Renewable energy is the key here. **The aim is to consistently generate renewable energy worldwide and distribute it expediently: power should be available when it is needed, or used when it is available.**

Two interdependent lifelines

And this is precisely why the AESs needs sector coupling. This includes linking the sectors via energy and data - the two main lifelines. Both are interdependent, with the energy flow taking place by way of the energetic coupling of the sectors. The data is the communicative part, through which information on energy requirements is exchanged.

The "energy lifeline" becomes tangible through AC and DC grids and intermediate storage. Batteries (electron storage), molecular (hydrogen, methane, e-fuels) or mechanical solutions such as hydroelectric power plants serve as storage systems. The choice depends on the storage duration and response time.

Standardisation is essential for the successful sector coupling of the "lifeline ". The sole standardisation of the data connector at hardware levels, however, is not sufficient for a control system. The digital twin offers a promising alternative here. IDTA is working with experts from various industries on so-called submodel templates that will enable this.

Smart consumers are on their way

Sector coupling and the associated comprehensive electrification also leads to more intelligent, controllable and therefore to electrical consumers, which also save energy. This effect also has a positive impact on the overall view of the AES, which will usher in many changes, while still harbouring a number of challenges. Above all, however, it should be seen as a huge opportunity to pave the way for a sustainable society.

In the coming issues, tec.news will be followinjg this course very closely – and especially the coupling of the sectors. A triad of strategic classifications, illustrative projects from the industrial arena and HARTING's experience in successful cases with partners and customers will form the supporting framework of each issue. The current content clearly shows the extent to which the AES is progressing dynamically and the relevance of the overarching goal: reducing CO2 emissions while nevertheless increasing the volume of energy available worldwide.

SWIMMING WITH THE CURRENT

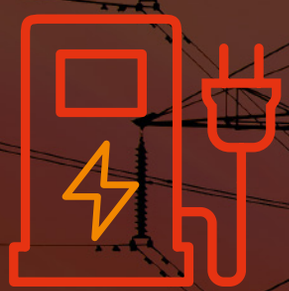
Growth and impact of electrification on the global energy mix and emissions: important milestones on route to the All Electric Society. We are seeing global progress in the electrification of various sectors and its impact on energy consumption and emissions. Forecasts show that the proportion of electricity will rise to over 27% by 2030.

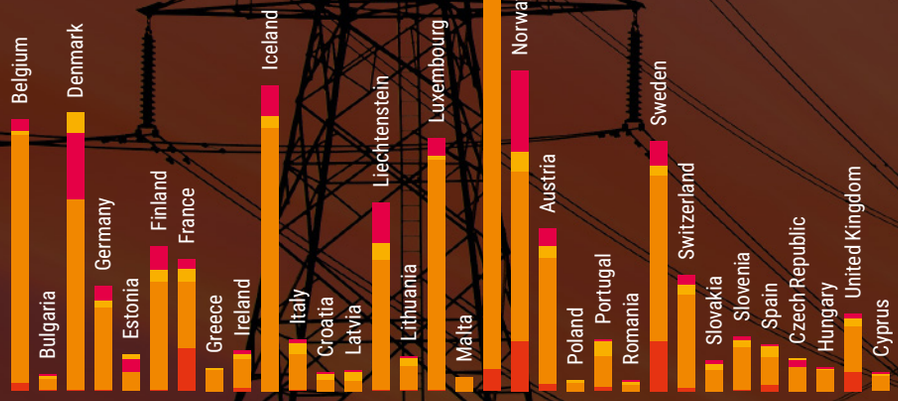
Fast charging infrastructure for e-cars gathering pace in Europe

Number of charging points per 100,000 residents

Source/data basis: IEA

Power: < 7,4 kW | 7,4 kW < CP < 22 kW | 22–150 kW | > 150 kW





Electrification picking up pace in all countries and sectors

Source/data basis: IEA

In 2022, China **achieved a 29% share of electric vehicle (EV) sales.** The government's target of selling 20% of electric vehicles by 2025 was thus reached three years early.

More than half of three-wheeler registrations in India in 2022 were electric.

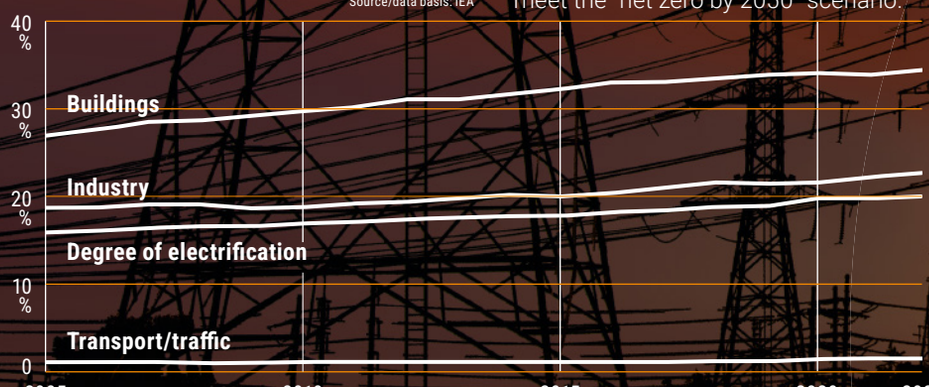
In 2022, more heatpumps were sold in France and USA than **heating systems using fossil fuels.**

In 2021, New Zealand **banned the installation of low and medium-temperature coal-fired boilers** in order to promote clean alternatives for industry.

Proportion of electricity in final energy consumption 2005-2022

Source/data basis: IEA

The proportion of electricity in energy demand must rise by 4% per year to meet the "net zero by 2050" scenario.



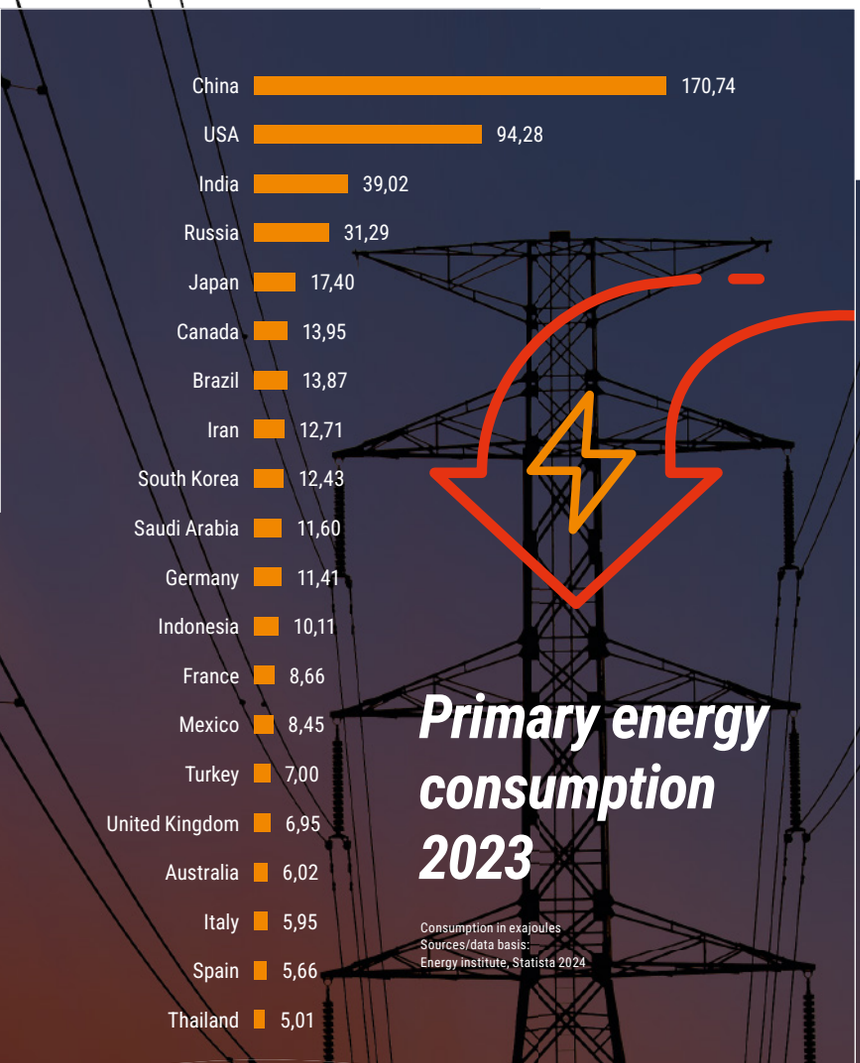
Electrification: Effective lever for reaching net zero targets

2022: **20 %**

2030: **27 %**

As more and more end-use equipment is electrified, the proportion of electricity in overall final energy consumption rises in the "net zero emissions by 2050" scenario (NZE).

Source/data basis: IEA



Primary energy consumption 2023

Consumption in exajoules
Sources/data basis:
Energy institute, Statista 2024

Proportion of renewable energy in electricity generation

2022: **29 %**

2028: **42 %**

Proportion of Variable Renewable Energy* (VRE) in electricity generation

2022: **12 %**

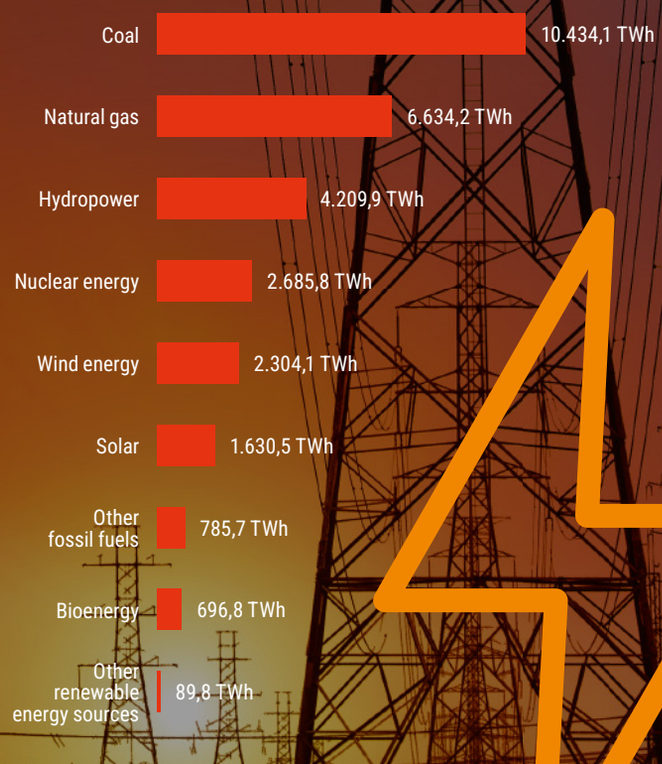
2028: **25 %**

The proportion of renewable energies in the global electricity generation mix is likely to rise from 29% in 2022 to 35% in 2025. The expansion of renewable energies will see a reduction in the proportion of coal and gas-fired electricity generation. Consequently, emissions from global electricity generation will reach a plateau by 2025, and the carbon intensity can be expected to fall further in future years.

* The expression "Variable Renewable Energy" (VRE) refers to renewable energy sources with which generation is variable or fluctuating. In particular, this includes wind and solar energy where production depends on natural weather conditions.

Source/data basis: IEA

Electricity generation by source of energy in 2023 worldwide



Source/data basis: Annual electricity data, Ember

E-car sales: Growth expectations for 2024 are based on a record year

Global sales of e-cars as a percentage of total vehicle sales in 2023

18 %

3.5 million more e-cars sold than in 2022

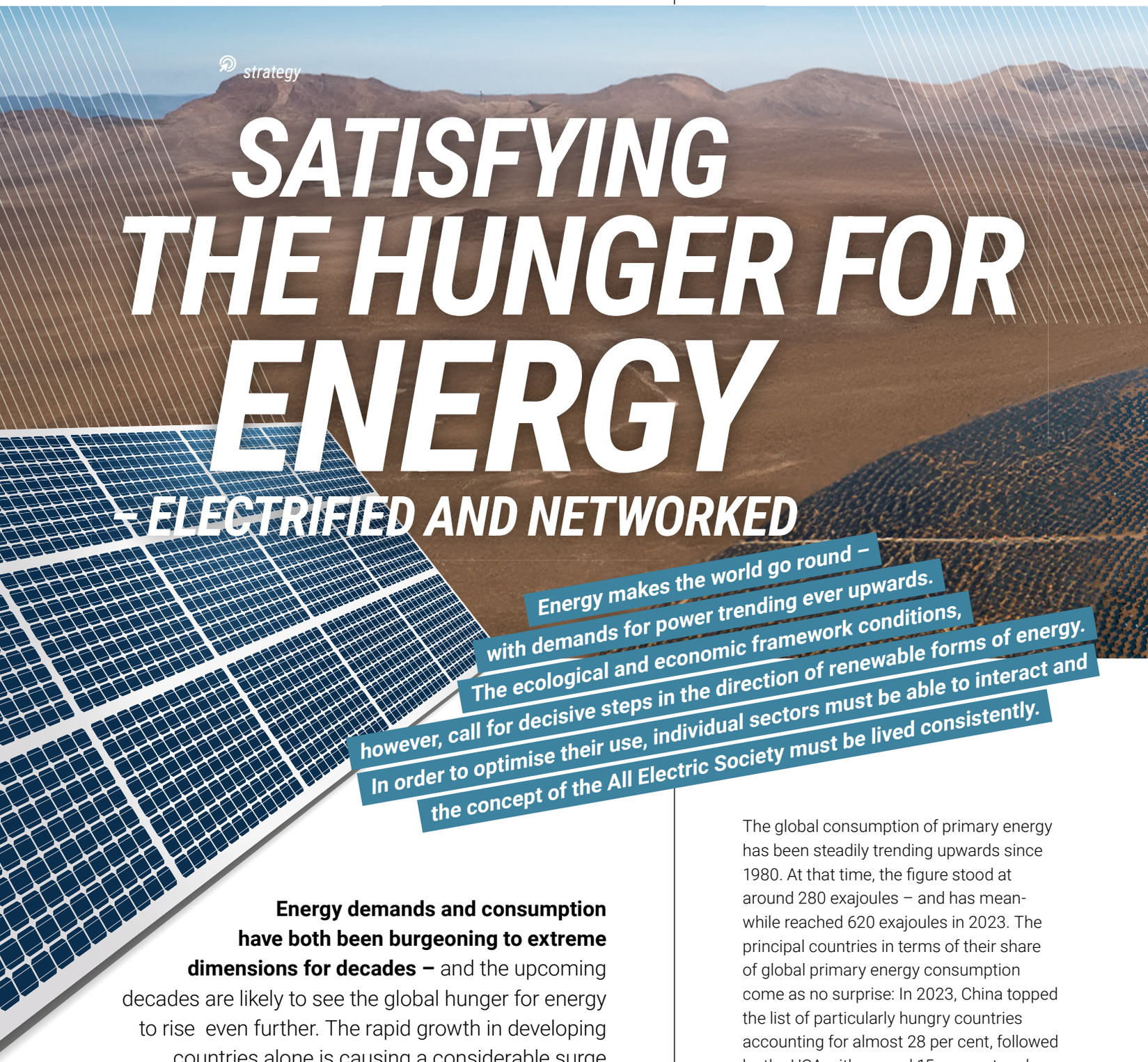
+35 %

In 2023, global sales of electric cars were close to 14 million, corresponding to 18% of all cars sold. **This is up from 14% in 2022.** In 2023, sales of electric cars were 3.5 million higher than in 2022, equating to a year-on-year rise of 35%. This demonstrates robust growth even if important markets are entering a new phase in which demand from early adopters is transitioning to the mass market. **Over 250,000 electric cars were sold per week last year, more than in a whole year a mere decade ago.**

Source/data basis: IEA

SATISFYING THE HUNGER FOR ENERGY

– ELECTRIFIED AND NETWORKED



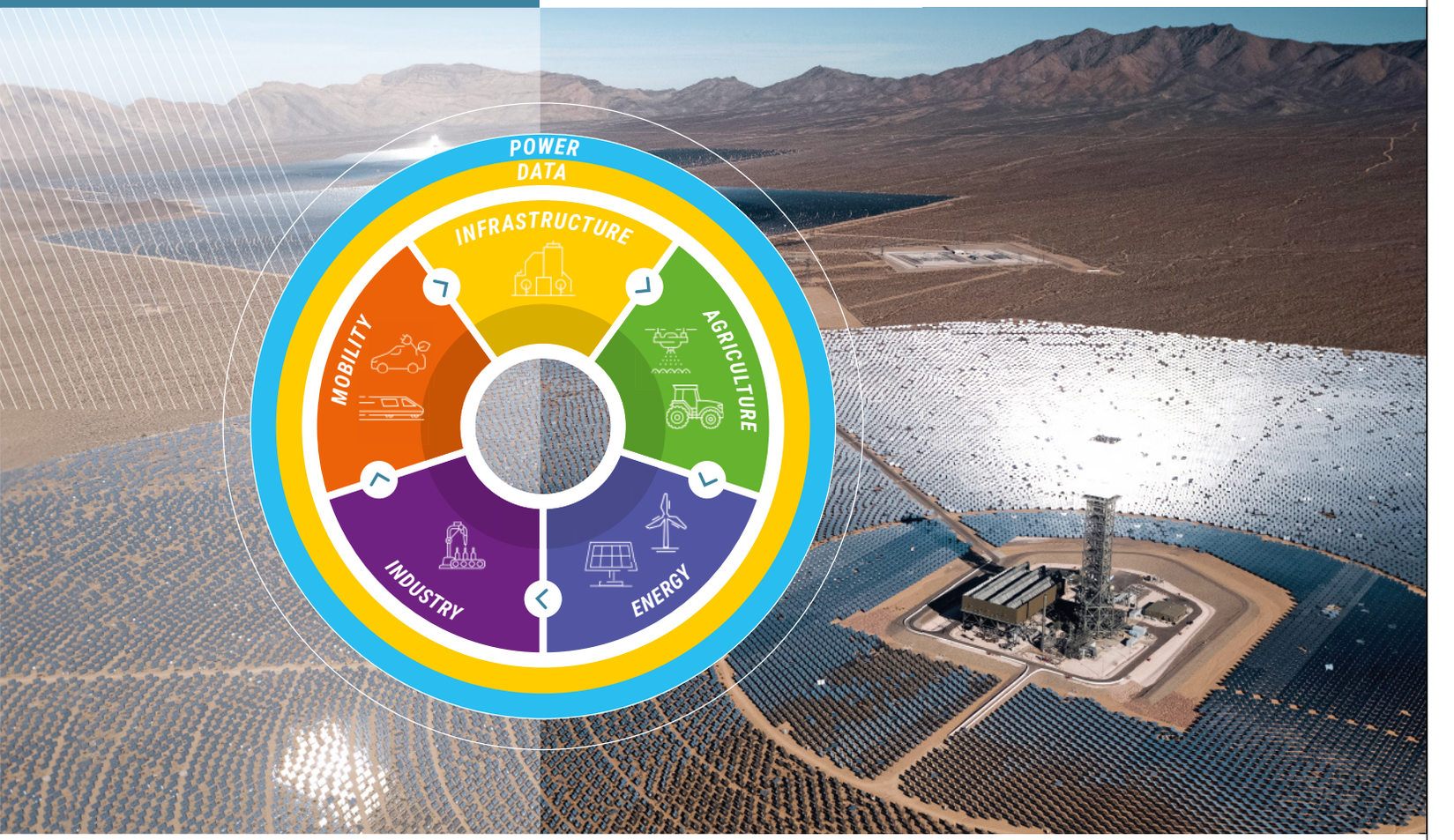
Energy makes the world go round – with demands for power trending ever upwards. The ecological and economic framework conditions, however, call for decisive steps in the direction of renewable forms of energy. In order to optimise their use, individual sectors must be able to interact and the concept of the All Electric Society must be lived consistently.

Energy demands and consumption have both been burgeoning to extreme dimensions for decades – and the upcoming decades are likely to see the global hunger for energy to rise even further. The rapid growth in developing countries alone is causing a considerable surge in energy demand.

Christian Otto
tec.news editorial team

The global consumption of primary energy has been steadily trending upwards since 1980. At that time, the figure stood at around 280 exajoules – and has meanwhile reached 620 exajoules in 2023. The principal countries in terms of their share of global primary energy consumption come as no surprise: In 2023, China topped the list of particularly hungry countries accounting for almost 28 per cent, followed by the USA with around 15 per cent and India with around 6 per cent.

Global energy demand is strongly driven by factors such as population growth, economic development and the transition to renewable energies.



Some forecasts, such as the World Energy Transitions Outlook 2023 of the International Renewable Energy Agency, do provide a genuine ray of hope despite the absolute increase: This is due to the fact that the studies expect the share of renewable energies in global electricity generation to increase significantly. By 2030, these forms of energy could cover between 45 and 50 per cent of global electricity demands, while this figure could rise to up to 85 per cent by 2050.

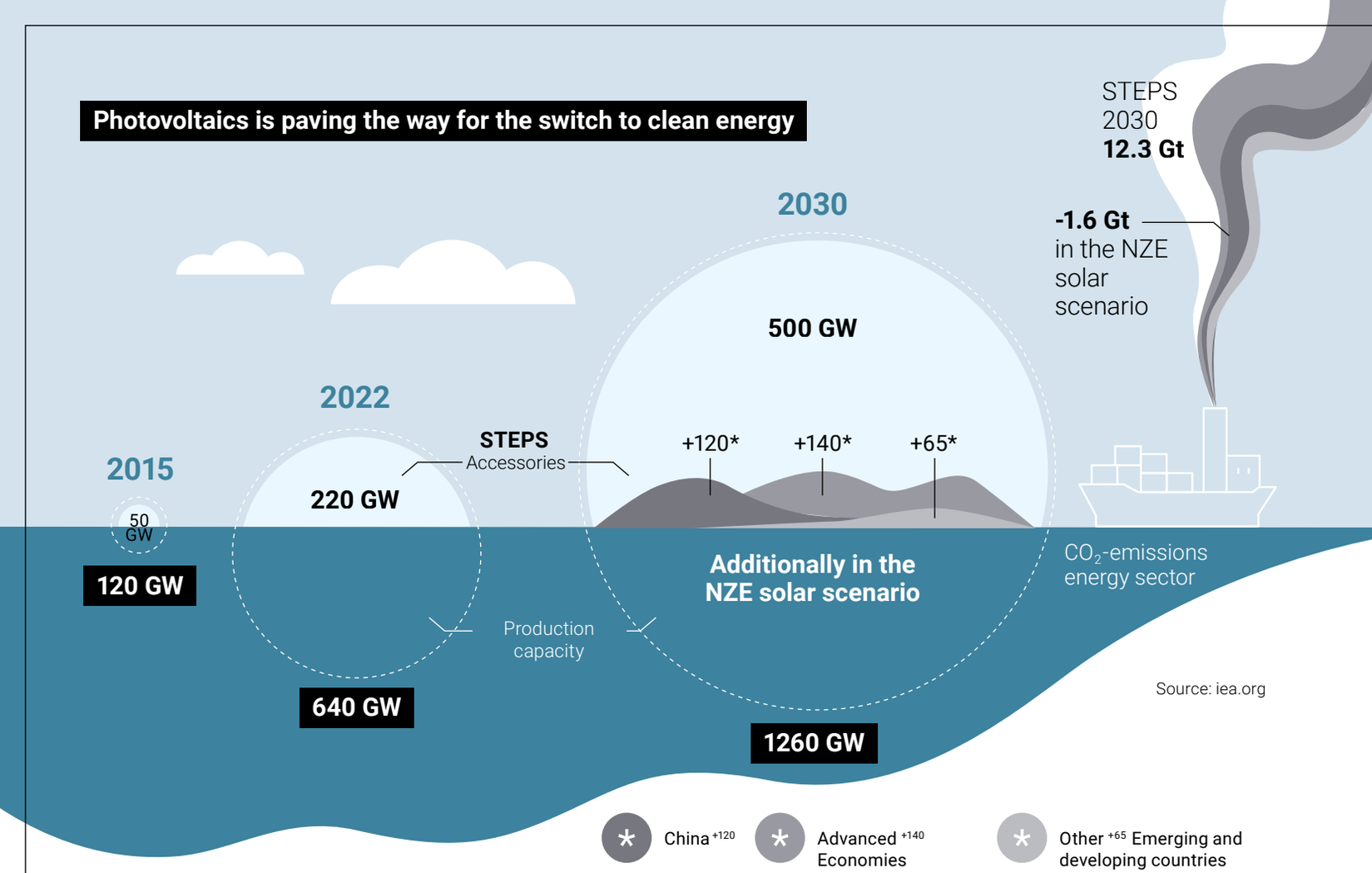
These figures underscore the concept of the All Electric Society (AES). The AES aims to create a sustainable and climate-neutral future in which all energy requirements are covered by renewable energy. This vision strives for a society that dispenses with fossil fuels and instead uses renewable energies and electrification as the central pillars of its energy supply. Andreas Huhmann, Strategy Consultant at HARTING, emphasises how relevant the implementation of the AES is:

"We are becoming increasingly aware of the man-made destabilisation of networked ecosystems. The AES could at least reduce this destabilisation to a level that does not lead to a collapse in the short term."

In order to meet the colossal energy demands, the AES harnesses solar energy, which can be generated from renewable sources such as photovoltaics (PV), wind and biomass. Around 0.3 to 1 per cent of the land mass would suffice to cover energy requirements by way of PV at today's efficiency levels. This currently assumes average efficiencies of solar systems of between 15 and 20 per cent, as well as the efficient use and storage of the energy generated. For Stephan Middelkamp, General Manager Quality & Technology, energy generation itself is therefore not the core challenge:
"If you look at the price development in recent years for the production costs of renewable energy, you can see that the cost-efficient provision is not a decisive problem either."

'The deeper ambition of the AES could hardly be greater: Solving the problem of energy supply for mankind.'

By contrast, however, the core of the AES – the demand-orientated distribution of energy – is indeed challenging. In order to be able to map this, the AES divides society into the sectors of industry, mobility, infrastructure and agriculture, which all have different energy requirements. In addition, there is the energy-generating sector.



However, the core of the AES – the needs-based distribution of energy – is demanding. It should be available when when it is needed.

Sector coupling is the keyword in interlinking these areas, which must be implemented both in terms of energy and data. On the one hand, this will allow energy to flow from one sector to another. On the other hand, the data-side coupling enables communication over the beyond the respective sector, providing the information as to the energy that is required there. The energy coupling takes place via alternating and direct current grids (AC and DC), as well as by way of intermediate storage.

Data coupling in turn requires different sectors to agree on standardised data models and protocols. The digital twin offers solutions here. The Industrial Digital Twin Association (IDTA) uses so called submodel templates for this purpose. These are standardised templates that are deployed in the modelling of so-called asset administration shells. These templates ensure standardised representation and interoperability of digital twins in industrial applications.

According to the HARTING experts Huhmann and Middelkamp, electrification will also have a major impact on the individual sectors over and beyond the coupling of the sectors. "The requirement that the sector or the consumers within the sector must exchange energy and data and be controllable results in the electrification of the consumers themselves," explains Middelkamp. The advantages ensuing: in most cases, electrical appliances will be easier to control and more energy-efficient.

The consistent implementation of the All Electric Society is not without its obstacles. However, the associated technical adaptations and their impact on society will, above all, yield one result: genuinely sustainable ways of life. Or as Andreas Huhmann puts things succinctly: "The AES is the last resort that makes the continued existence of human civilisation at least conceivable."

strategy

THE „ALL“ MAKES ALL THE DIFFERENCE

The "All Electric Society" is already firmly established – as a term. The actual realisation, however, is still a long way off. In this interview, Andreas Huhmann, Strategy Consultant, and Stephan Middelkamp, General Manager for Quality and Technologies at HARTING, explain what it will take to achieve this.

tec.news: The All Electric Society is not a new topic. In actual fact, we've been talking about it for several years now. Nevertheless, you get the feeling that things are not really moving forward. Is this feeling correct and if so, what are the reasons for this?

Andreas Huhmann (AH): We must not perceive the All Electric Society as a mere vision, but rather as a statement that is already present in many aspects of our everyday lives. Many processes in our society, and also in our working lives, are strongly characterised by electricity, which means that we have already taken some steps in the right direction. However, there is still a lack of comprehensive integration of all the technological advances and systems that would be necessary to genuinely realise the All Electric Society. We live in a time in which the technical possibilities are given to make significant progress. But the key we are missing is a clear strategy on how we can connect these different systems and processes to achieve the genuine benefits for our sustainability and society. **So while we are already living in an Electric Society, we still have to take the final steps towards an All Electric Society.**

In order to understand this a little better: What distinguishes the All Electric Society from the Electric Society that we are living in today?

AH: Well, yes we do in fact already live in an electric society in which electricity is used for a wealth of applications every day. This is significant progress that we should not underestimate. But naturally, there are still a few important steps to be taken before the All Electric Society is fully achieved. This society should not only encompass the use of electricity, but also the complete integration of all protagonists – both consumers and producers. The difference lies in the way these players interact with each other and create a dynamic, intelligent system. If we really want to achieve the All Electric Society, we need to optimise the interaction between the various systems so that we can work more efficiently and sustainably.

It's not just about making electricity available, but about utilising it in such a way that everyone involved can benefit to the maximum extent.

If we really want to achieve the All Electric Society, we need to optimise the interaction between the various systems.

Dr. Stephan Middelkamp
General Manager Quality & Technologies, HARTING Stiftung & Co. KG

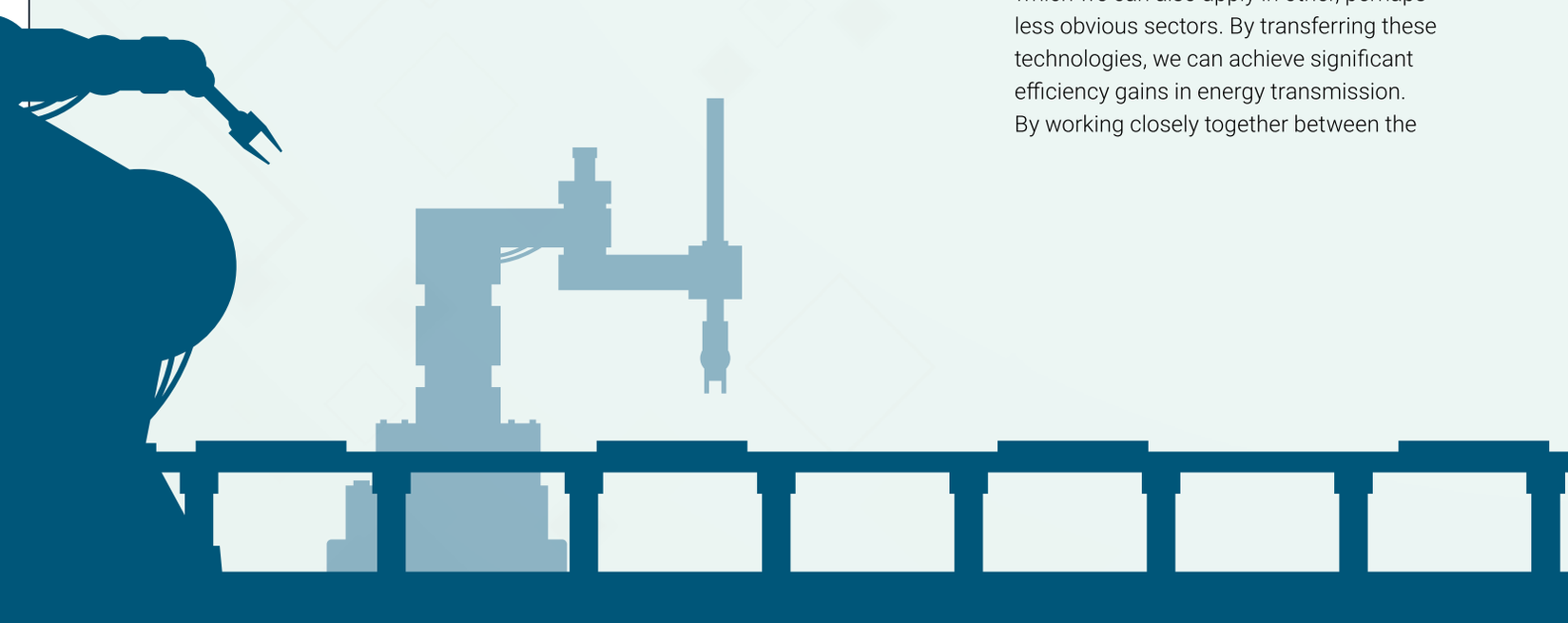
It is extremely important to find the right balance here.

What are the major challenges that still lie ahead of us on this journey?
Stephan Middelkamp (SM): It starts with the fact that change is necessary in diversified sectors such as energy production, the automotive industry and other areas so as to ultimately realise the All Electric Society. These sectors face specific problems that are often deeply rooted in their existing structures. **We currently have to work on several fronts at the same time: driving technological innovations forward, gaining consumer acceptance and promoting price reductions in the renewable energy sector.** The key will be to recognise and accept that such change is often not free of pain. We must understand that the path is not easy, that each step must be small and that we will need patience in order to make genuine progress.

The path is not easy, each step must be small and that we will need patience in order to make genuine progress.

Sector coupling is one term that keeps coming up in this context. What does this exactly mean?
SM: Fundamentally, it's about networking different sectors more closely and extensively – take energy, industry or transport, for example. When we talk about sector coupling, it is important to understand that many sectors traditionally work in isolation and are often not ready and willing to co-operate beyond their own boundaries – meaning that we have to overcome major hurdles in the areas of standards and interoperability. At present, there are many sector-specific standards that obstruct this cooperation. In order to actually achieve sector coupling, it will be crucial that we electrify and interconnect the existing sectors. This means that we have to adapt the infrastructure and existing technologies in such a way that they offer practicable solutions and can be integrated within the shortest possible span of time. Without such integration, we will only be able to make very limited progress.

What role can HARTING's ideas and products play in this undertaking?
AH: At HARTING, we regard our technologies as one of the keys to cross-sector applications. **It is important that we not only optimise our products for a specific sector, but also think beyond individual sectors.** A key example is the use of technologies from the data centre sector, which we can also apply in other, perhaps less obvious sectors. By transferring these technologies, we can achieve significant efficiency gains in energy transmission. By working closely together between the



sectors and utilising synergies, we will not only advance the All Electric Society, but also demonstrate how much potential this integration holds. If we are able to develop a 360-degree view, this will not only help our company, but will also be of great benefit to society as a whole.

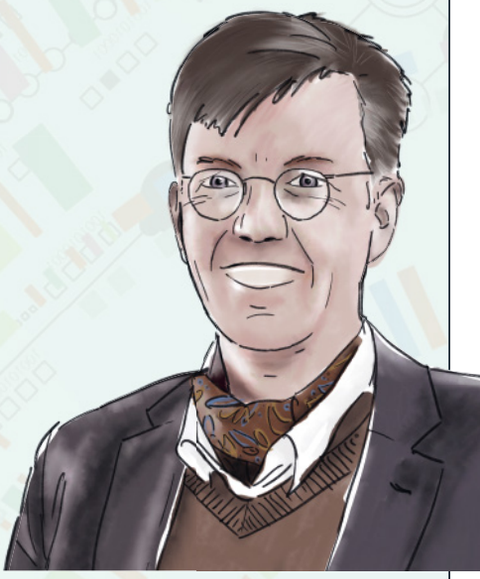
If you consider all this, you can't help but think about standardisation issues. It feels like standards are loved as much as they are hated. But aren't they indispensable in this case?

SM: Absolutely! I am convinced that a certain degree of standardisation is essential if we want to achieve more effective cooperation in the All Electric Society. But, as the question suggests, we should also exercise caution, as excessive standardisation can also limit the ability to innovate. Consequently, it is extremely important to find the right balance here. **Standardisation must be designed so as to benefit companies and their products without them losing flexibility and individuality.** Standards should not only meet the respective technical requirements, but also ensure that every manufacturer has the freedom to develop innovative solutions. This will enable us to design robust and future-proof systems that are tailored to the specific needs of the given applications. Ultimately, standardisation must therefore offer both a long-term vision and practical applicability.

So it depends on the individual case in the end?

SM: Yes, as in so many other cases, one has to judge what is best on a case-by-case basis. In principle, the DC component will increase overall. Let's take the energy sector as an example. The layout of a connector can be designed in such a way that it is as ideal as possible for the few relevant voltage classes. In such an instance, standardisation then also makes sense.

AH: And where it is possible, standardisation naturally helps with scaling. It is also about being able to use components and devices internationally as conveniently as possible. And this is a great deal easier with standardised connections.



Andreas Huhmann
Strategy Consultant,
HARTING Stiftung & Co. KG

We do in fact already live in an electric society.

Lars Kühme
Manager Media and Publications,
HARTING Stiftung & Co. KG

strategy

THE LONG-DISTANCE RACE IS ON

The electrical and digital industry is a guarantor for successful electrification and consequently also for the necessary sector coupling. The relevant industry association, however, does not expect the transformation process to be a sprint. First movers in the industry and attractive framework conditions on the part of policymakers are key aspects for the organization.

The German Electro and Digital Industry Association (ZVEI) organised the "All Electric Society Arena" at the Hannover Messe for the first time this year. With this step, the organisation emphasised the relevance of the topic and committed itself and its members to not only to discussing the All Electric Society (AES), but above all to shaping and designing it.

ZVEI regards sector coupling as playing a central role in the transformation of energy supply: this will enable the integration of different energy sources and sectors in order to create a sustainable and emission-free future. Electrification is the essential key here, as it combines industry, mobility and energy supply in a closed-loop system.

Gunther Koschnick, ZVEI Head of Industry, perceives growing enthusiasm for electrification in society. There are also challenges, however: **"The course to the All Electric Society is not a sprint, but a long-distance race. Progress in electrification requires patience and a long-term commitment to develop the necessary infrastructure and familiarize people with the benefits of electrification."**

Electrical and digital industries as technology drivers

Renewable energies and innovative technologies have a decisive role to play in sector coupling. According to Koschnick, the industry represented by ZVEI could provide these technologies - and it already does. The proof: The use of energy management systems (EMS), heat pumps, electric cars and PV systems can be intelligently controlled and thereby utilised to benefit the grid. This applies, for example, to the bidirectional charging of electric cars, which can also serve as storage units. In addition, smart metering systems enable secure communication between the EMS and the grid operator and form the foundation for dynamic electricity tariffs.

Another significant aspect is the **development of smart grids** that enable efficient load distribution and energy exchange between the various sectors in order to cover overall demand more sustainably.

The political and economic framework conditions also play a key role in the development process. Koschnick emphasises that companies investing in technology

Gunther Koschnik
Director Industry,
ZVEI e. V.

"The look to the future calls for a pioneering spirit and the determination to break new ground."

need investment security. This security is based on standards, clearly defined regulatory guidelines and requirements as well as incentive systems. After all, acceptance in society is crucial to making progress. In particular, the expansion of the infrastructure for electromobility is a key concern that is still being insufficiently pursued.

The right communication

ZVEI is involved in specific campaigns and initiatives to further promote the topics of electrification and AES. Koschnick emphasises that **it is crucial to inform the public and present best practices** in order to raise the overall awareness of the benefits of sector coupling. The presentation at trade fairs - such as in Hanover - and addressing the general public plays an important role in communicating the successes of the member companies.

The ZVEI association also promotes sector coupling and electrification in Germany through its political commitment. Through discussions with legislative decision-makers, the aim is to create general framework conditions that support the expansion of the infrastructure and reduce bureaucratic obstacles. The association is also committed to developing standards and norms that facilitate the integration of the multifaceted technologies. In co-operation with companies and research institutes, ZVEI supports innovative projects that act as beacons and serve as notable examples of best practices. Gunther Koschnick emphasises the importance of these joint efforts: They create trust in new solutions and serve to advance their widespread use.

Creating concrete incentives

ZVEI regards investment security as a central and vital factor in the acceptance of new technologies. Koschnick emphasises that electricity, especially from renewable energies, should no longer be more expensive than fossil fuels: "Incentive systems are necessary to create the most attractive framework conditions for investments. A well-designed regulatory environment is becoming increasingly pivotal to encourage companies and people to invest in innovative technologies. Specifically, ZVEI is in favour of reducing the electricity tax to the EU minimum and abolishing other levies, such as the CHP levy."

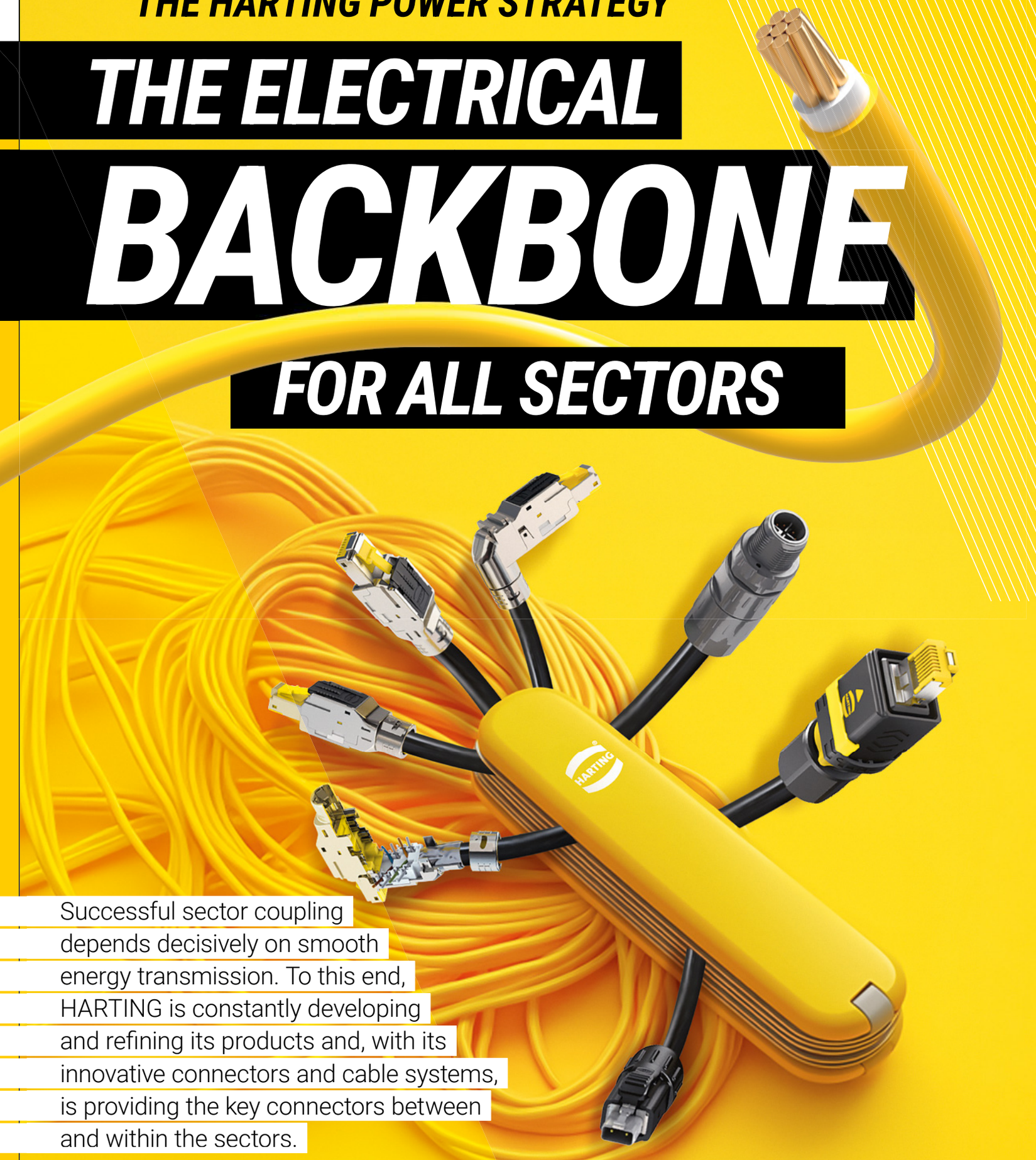
Incentive systems are necessary to create the most attractive framework conditions for investments.

The look to the future calls for a "pioneering spirit and the determination to break new ground", as the ZVEI division manager states. The so-called "first mover" advantage is important here: Companies that invest in electrification now stand to gain a decisive competitive advantage over later players. What's more, a long-term vision for an electrified society must be clearly communicated in order to drive the transformation forward.

Detlef Sieverdingbeck
General Manager
Corporate Communication & Branding,
HARTING Technology Group

THE HARTING POWER STRATEGY

THE ELECTRICAL BACKBONE FOR ALL SECTORS



Successful sector coupling depends decisively on smooth energy transmission. To this end, HARTING is constantly developing and refining its products and, with its innovative connectors and cable systems, is providing the key connectors between and within the sectors.

As a result, power generation and consumption were analysed separately. This can no longer serve as a starting point. Within the context of the AES, we need a comprehensive, holistic system and the coupling of producers and consumers, in other words, sector coupling between all sectors.

The focus here is on the holistic mission of sector coupling, especially when it comes to the topic of power. We see all sectors of the AES. Individual segments are currently highly significant.

If everything in an AES is covered electrically in the future and the respective limits are reached more often, connectors are a decidedly critical component.

In order to bring the vision of the All Electric Society (AES) to life, there are two vital lifelines that make sector coupling possible in the first place: the cross-sector flow of data and the cross-sector flow of energy.

And it is precisely these two topics – data and power – that the HARTING product portfolio is focusing on. Connectors and cables are the technical enablers that, above all, enable the consistent, continuous flow energy.

For the GBU Electric the importance of the components in applications counts. The AES presupposes a more extensive use of connectors, as these are pivotal for coupling the electrical backbone of all sectors.

In the past, a very strong focus was placed on the markets when developing connectivity solutions.

There are four segments - Wind, Electrical Grid, Hydrogen and Energy Storage - that can be attributed to energy generation and energy transport. HARTING is able to address these segments on the basis of technologies and the right customer access.

This broader application range calls for connectors with more extensive properties: they must enable the convergent use of power and data in the future and continue to be optimally adapted to the concrete and specific application in the respective sectors. Especially when it comes to the relevant points and issues such as environmental conditions, service life, manageability, installation and safety.

If everything in an AES is covered electrically in the future and the respective limits are reached more often, connectors are a decidedly critical component. Specifically, there are increased challenges to be met in terms of thermal aspects and energy efficiency. The AES requires a more open mindset when it comes to the types of electricity used. Direct current is playing an increasingly important role here.

HARTING's focus will be on the development side. For example, on reducing contact resistance, while at the same time ensuring secure mating, Research will be conducted in the contact area in particular. This requires new contact technologies, a broad foundation of applications and options for simulation and testing. The GBU Electric will work intensively on these topics.

Complementary to the connector portfolio, HARTING commands in-depth, comprehensive expertise in the field of cabling thanks to HARTING Customised Solutions (HCS). HCS is also well equipped to meet the requirements of the AES and supports the strong focus on holistic connectivity for power.

HCS's expertise is also strengthened by the strategic partnership with Switzerland-based Studer Cables AG. Here, it is primarily the expertise in high-performance cables that is set to contribute to the commitment revolving around the AES.

Consequently, HARTING's expertise in connectivity is not only evident in connectors, but far more, extends across the entire range of cabling applications.

A 360-degree view conceptionally closes the circle of all sectors in terms of key technologies. The HARTING contribution and role in sector coupling is a higher uniformity of connectors.

They will be media-compatible or even plug-compatible and can therefore be used in different application areas.

Power solutions will also be driven forward in the cable sector. The challenge lies in the fact that there are currently no standardised universal connections to power devices in many applications, meaning that it is not possible to offer system cables based on these components. However, HARTING is a "trendsetter" here – and that applies both to the device side and as a provider of the necessary system cabling.

Consequently, HCS is already thinking about system interfaces with cabling customised to the respective applications – which is a competitive advantage and forward-looking. The pre-assembled unit can become a major problem if there is an interface that does not have a suitable cabling solution.

A key advantage of the extensive product portfolio and the all-encompassing approach is HARTING's ability to parallelise processes that would otherwise proceed iteratively. Accordingly, connectors and cables are conceived and thought through in parallel in the relevant projects.

This means that HARTING's contribution to sector coupling lies in the use of convergent transmission technologies with connectivity that is perfectly adapted to the application.

Norbert Gemmeke
Managing Director, HARTING Electric

Jörg Scheer
Managing Director, HARTING Customised Solutions

LEVERAGING THE ADVANTAGES OF DC-DRIVES

There are very few production environments working in DC networks. Does that mean that the advantages of direct current are not being utilised? Quite the opposite: DC drive systems have been on the job in a wide variety of applications for years. Now it's time to operate them with direct current to unleash their fullest potential.

The DC Industry project has brought the use of direct current in industry back into focus more strongly. This is a sensible step, as there are numerous DC systems in the meantime that have been playing to their strengths in industrial environments for years. Direct current ensures a consistent power supply, which allows for more precise manufacturing and more accurate control – which is why electronics and semiconductor manufacturers in particular are focussing on direct current systems.

DC drives also enable more precise control and faster reaction times in production robots such as those from Kuka. In many of its industrial robots, the Augsburg-based machine manufacturer relies on DC motors, in particular brushless DC motors (BLDC). Robots such as the Kuka KR Agilus, which finds use in the automotive industry, electronics production and other areas, harness DC drives for their axes and gripping mechanisms. Similar application areas can be found in the industrial robots of the M series from Fanuc, the Motoman MH series from Yaskawa and the IRB series from ABB, but also in the cobots of the UR series from Universal Robots, the mobile robots of the LD series mobile robots from Omron as well as in the PGN-plus gripper from Schunk. DC drives are also at work in conveyor systems or logistics systems from Dematic or SSI Schäfer.

All of these applications benefit from the advantages of DC drives: highly sensitive and precise control of position, torque and speed, high efficiency and a long service life. DC motors can also be integrated into compact designs, which is a decisive product feature in robotics.

Systems fit for direct current

Production automation is therefore an important field for DC technology, as it is widely used in robotics in particular. The drive specialist Danfoss is another supplier of this technology, most notably with its VLT FlexMotion series. One notable product, for example, is the Multiaxis Servo Drive MSD 510, which was specially developed for scenarios with DC link voltages in the range from 565 to 680 V DC.

Danfoss has designed its FlexMotion drives and controllers to work with different power sources - including with direct current. By supporting direct current supply and optimised cabling, the system can be utilised directly in industrial direct current networks in industry and reduces energy losses. The VLT FlexMotion series relies on hybrid cabling that transmits both the DC power supply and signals for controlling machines in a single cable. This ensures a more efficient and flexible system architecture that can be integrated into a variety of machine architectures. The series is particularly suitable for applications involving hybrid and all-electric drive systems that operate precisely, flexibly and energy-efficiently.

Other drive technology manufacturers, however, are also supplying corresponding products: Bosch Rexroth, for example, is offering various systems for industrial applications, including ctrlX Drive, which comprises highly efficient DC-based servo drives for precise motion control. The system can be configured for various tasks in factory automation and features compact and powerful motors that operate with high energy efficiency. The Indra Drive ML is another drive which can function both as a regenerative power supply and as a motor inverter. This drive is particularly suitable for large applications, as it can support several units in parallel, enabling higher performance, which is ideal for complex production environments. These drives integrate well into DC environments and enable the smooth control of multiple axes, energy recovery and optimised energy use thanks to advanced features such as DC bus connections and intelligent energy management systems.

There are already devices in every factory that are actually running on direct current.

Utilising full efficiency without losses

Given their advantages, DC motors are at work in a wide variety of areas – so far mostly in AC environments. If they are operated directly from the DC grid, there is no need for an inverter and the associated installation and maintenance costs. In addition, by eliminating the inverter, the losses that would otherwise be incurred by conversion can be reduced, thereby increasing the overall energy efficiency of the system. What's more, the elimination of the conversion stages also simplifies the system architecture, meaning less wiring and less space will be required.

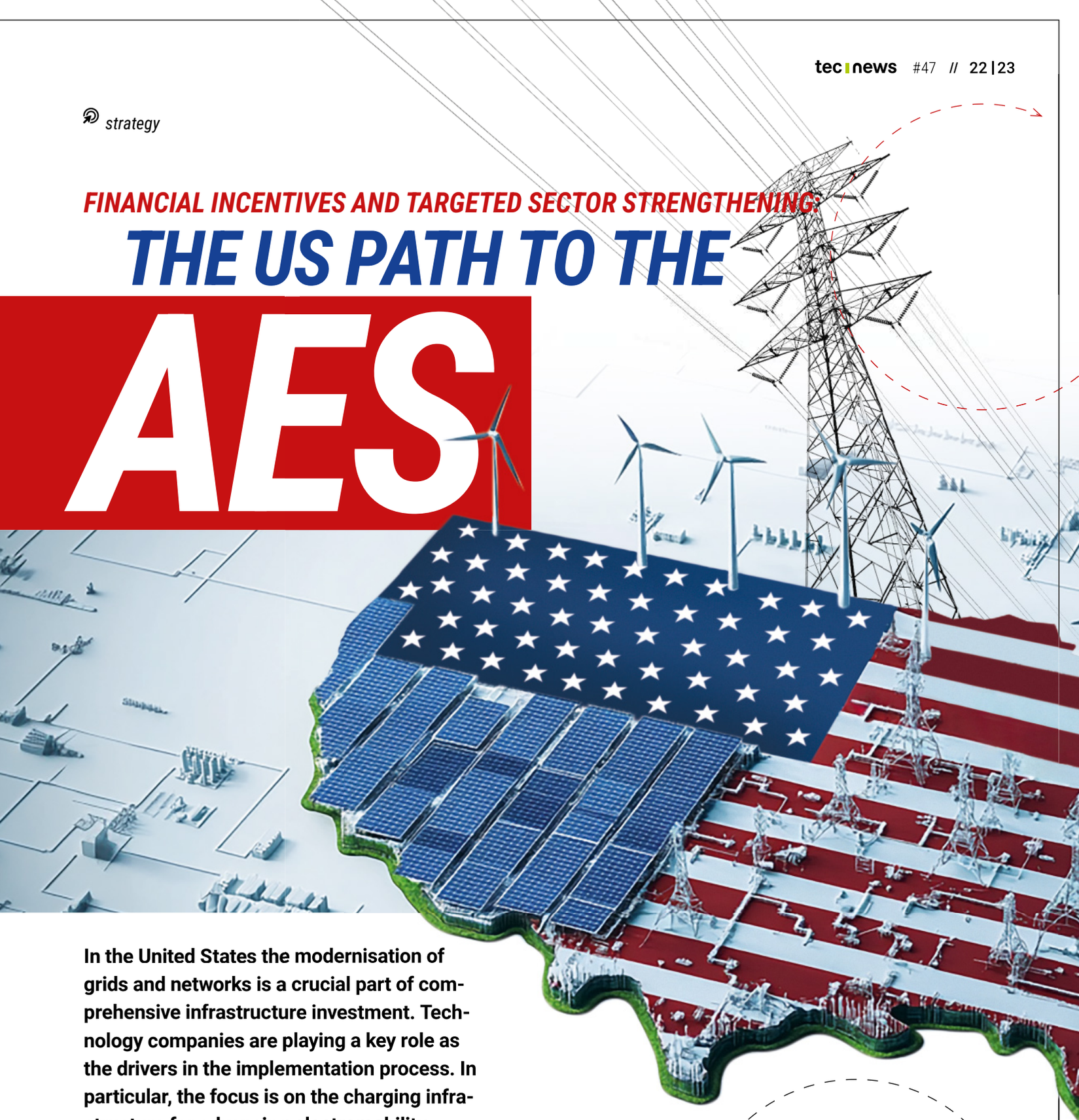
There are already devices in every factory that are actually running on direct current: in addition to the examples cited, there are also ventilation systems and LED lighting to consider. So why accept the losses? It would be far more efficient to supply the systems directly with direct current. The company Lapp has realised this for its plant in Forbach, together with Fraunhofer IPA. According to their stock taking, a good 10 per cent of consumers could have been supplied with direct current right from the outset – from the electricity generated by the photovoltaic system, for example.

Stefanie Michel
tec.news editorial team

strategy

FINANCIAL INCENTIVES AND TARGETED SECTOR STRENGTHENING:

THE US PATH TO THE AES

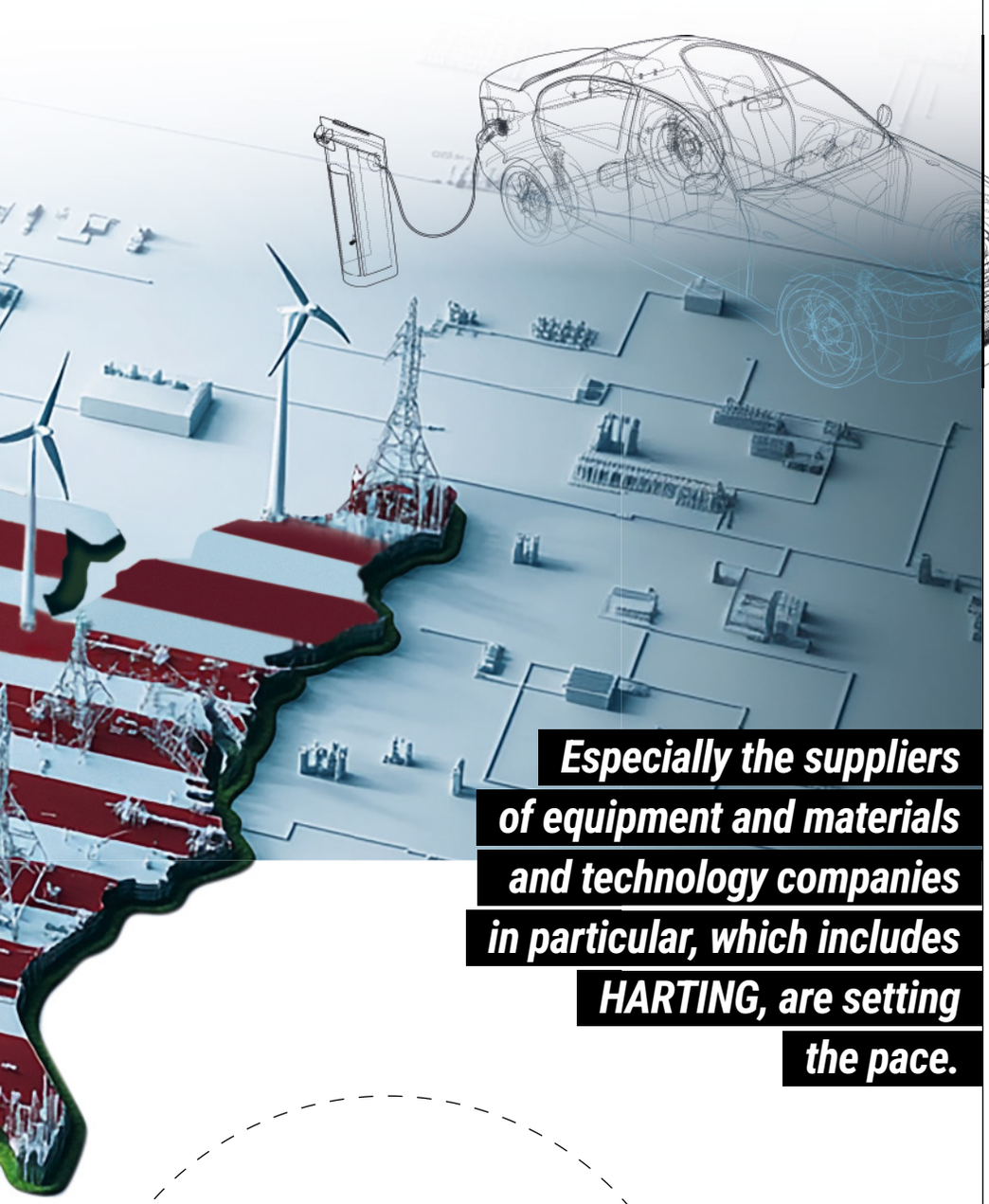


In the United States the modernisation of grids and networks is a crucial part of comprehensive infrastructure investment. Technology companies are playing a key role as the drivers in the implementation process. In particular, the focus is on the charging infrastructure for advancing electromobility.

The formula for success

Standardization.

THE US PATH TO THE AES



Especially the suppliers of equipment and materials and technology companies in particular, which includes HARTING, are setting the pace.

The US government is setting the course to upgrade and modernize energy supply infrastructures in order to meet rising energy demand. In doing so, it is accelerating the country's path towards the All Electric Society. The Bipartisan Infrastructure Law and the Inflation Reduction Act are legislation passed to help achieve this.

These extensive financial resources deployed are aimed at network resilience and the expansion of transmission capacities. The objective is to improve the reliability, efficiency and sustainability of supply projects. Federal funding programs are playing a decisive role in the United States in order to support the transformation. It is only through such programs that projects ranging from grid modernization to the integration of renewable energies can be driven forward.

The sheer dimensions involved in promoting the transformation in the United States are impressive: The Bipartisan Infrastructure Act (also known as the Infrastructure Investment and Jobs Act) alone is investing a hefty $660 billion over five years in critical transport infrastructure projects. The program aims to create 700,000 jobs in supporting sectors, including construction, manufacturing and transport among others.

In addition to funding, industry players are particularly relevant. This is due to the fact that they are the key drivers of the projects, as they understand the requirements and processes needed to modernize the infrastructure. Utility companies and infrastructure providers are only some of the stakeholders involved here. Especially the suppliers of equipment and materials and technology companies in particular, which includes HARTING, are setting the pace. Their components are part of the larger ecosystem, while their expertise helps to better identify synergies, avoid potential conflicts and utilize the collective expertise. The relevant federal funding programs such as Grid Resilience Grants, the Trans-

mission Facilitation Program or Transmission Facility Financing are managed by the US Department of Energy. The funding programs have specific requirements criteria, making the funding process at time complex. The effort, however, makes sense in view of supporting of the larger aims and objectives.

Members of HARTING's US team are contributing their knowledge and expertise to the industry.

Cooperation with regulatory authorities and committees is necessary. This enables transparent project organization and secures realistic requirements and standards. Members of HARTING's US team are involved in the committees responsible for setting and commenting on such standards, thereby contributing their knowledge and expertise to the industry. In this way they are helping to shape the course to the US-based All Electric Society at a practical level.

In the course of the shifting demands made on the electricity grid, utility companies are undergoing significant technological upheavals. This includes the implementation of advanced grid management systems, smart metering systems and distributed energy resources to optimise grid operations and manage the increasing penetration of renewable energy.

Among other things, the rapid installation of transformer substations is playing a decisive role in the seamless integration of renewable energy sources into the grid infrastructure.

Given that renewable energy generation is growing exponentially, the need for a robust substation infrastructure is becoming increasingly vital in enabling the efficient and reliable transmission and distribution of electricity.

The support of infrastructure for clean technologies and the development of a charging infrastructure for electric vehicles (EV) represents another key focus. The reliability and standardization of the charging infrastructure also present challenges. These aspects, however, are the best way to convince consumers of the benefits of electrification over the long term. Manufacturers, however, must also keep a keen eye on the sustainability of the electrical grid.

The US charging infrastructure is currently undergoing a transformation from the Type 1 connector to the Tesla-like connector known as the North American Charging Standard (NACS). Almost all of the major car manufacturers have committed to integrating the new connection style into their electric vehicles in the USA by the year 2025. The US government is also stepping up with a comprehensive budget for standardisation: a total of 8 billion US dollars have been earmarked for the charging infrastructure over the next five years.

Faster charging options is the main goal here, which requires charging with direct current (DC). This significantly shortens charging times and should offer a level of convenience comparable to conventional refueling of combustion vehicles. In addition to this, charging safety is of the utmost importance. High-quality adapters and connectors are minimizing the potential risks. However, poorly made adapters risk having improper contact at their terminals. The Charging Interface Initiative (CharIN) e. V. recommends ensuring that an adapter has been approved as safe by the EV OEM before being used for charging.

However, it is not just the mere updating of physical connector types that providers are now involved with. Far more, they are shaping and designing a major step towards a more unified and accessible charging infrastructure for electric vehicles. As standardization is thought through across brands, this is promoting interoperability between vehicles and charging stations and creating a collaborative environment in which technical innovations will enjoy better growth conditions.

The US is making greater strides than ever in accelerating the path to more reliable and cleaner energy. This applies to the entire energy chain - from how power is generated and delivered to how consumers use that energy. As a key component of the interconnection between all these levels of the energy chain, HARTING is well positioned to power this revolution with its world-trusted, industry leaving connectivity solutions.

As a key component of the interconnection between all these levels of the energy chain, HARTING is well positioned to power this revolution with its world-trusted, industry leaving connectivity solutions.

Jon DeSouza
President and CEO,
HARTING North America

Emily Roth
Industry Segment Manager Energy,
HARTING North America

DENMARK:

AN INTELLIGENT ENERGY SYSTEM THAT ENABLES A GREEN AND SAFE TRANSITION

In neighbouring northern European countries, the All Electric Society is already more tangible. Above all Green Power Denmark with its members is an active driver. Christina Burgos Nittegaard, Head of the Intelligent Energy Department at the business organisation, gives an insight the goals and challenges.

Lars Kühme
Manager Media and Publications, HARTING Stiftung & Co. KG

Christina Burgos Nittegaard
Head of the Intelligent Energy Department, Green Power Denmark

We work to achieve the climate targets through flexible energy infrastructure and consumption, paving the way for deep integration of RE production.

In Denmark, it is possible to buy electricity at a spot price – whenever there is a lot of green electricity available, it is usually cheap.

tec.news: Ms Burgos Nittegaard, what are your main goals and how do you do you contribute in achieving an All Electric Society?

Christina Burgos Nittegaard (CBN): The mission for Intelligent Energy is for Denmark to be among the first countries worldwide to transition to an intelligent energy and supply system. We work to achieve the climate targets through flexible energy infrastructure and consumption, paving the way for deep integration of RE production. The road is paved with data-driven solutions that connect sectors to balance the production from wind and sun. We do this by contributing to good frameworks for sector coupling, energy efficiency and a flexible energy market. We bring together a broad spectrum of stakeholders in the Danish value chain: our participants are from the energy and supply sector, technology providers, consultants, municipalities, investors, and knowledge institutions – like universities etc.

Denmark is a front runner when it comes to smart grids that are based on available technologies. What kind of challenges are you facing right now?

CBN: The challenge of such a network is to efficiently balance all power sources on the one side and the users of power on the other side. In Denmark, it is possible to buy electricity at a spot price – whenever there is a lot of green electricity available, it is usually cheap. But if there is no wind or sun, electricity can be quite expensive. **If you own an electric vehicle, it can be an efficient system.** However, in the future, it can also lead to new problems because when the price is low, the demand for electricity rises exponentially. In the future, the infrastructure can, hence, struggle to handle the intense consumption. We believe market products beyond spot price is part of the answer. Future products should enable both a more efficient use of the capacity in the power grid and balance the electricity market. This should enable an energy system to handle more production and consumption of green electricity more quickly, which moves us faster and more cost-effectively towards climate goals.

How do smart meters support you in realising your goals?

CBN: Since 2020, all buildings in Denmark have been equipped with smart meters — digital electricity meters that record hourly consumption. These meters provide utility operators with detailed insights into the electrical grid, enhancing their ability to understand, predict, and optimize based on consumption patterns, further driving innovation across the sector. Similar digital meters are being installed to monitor heating and, in many cases, water usage, enabling additional improvements across multiple utility systems. The Danish government has recently launched a program to explore how data from these and other sources can be securely shared, ensuring privacy while unlocking the full potential for tomorrow's solutions.

Will all goals be achieved once an AES is fully realized?

CBN: It's important to recognize that transitioning to an All-Electric Society won't automatically solve all challenges, even though it will lead to a more energy-efficient system with significantly reduced or no emissions. There will still be issues, such as limited resources and ensuring safety.

GREEN POWER DENMARK

is a non-commercial business organization gathering around 1,500 members from across the green energy value chain. Green Power Denmark represents companies in the renewable energy industry, owners and developers of renewable energy systems, electricity companies, distribution system operators (DSOs), energy trading companies, and companies that work to refine, convert, and store green electricity.

greenpowerdenmark.dk

customer benefits

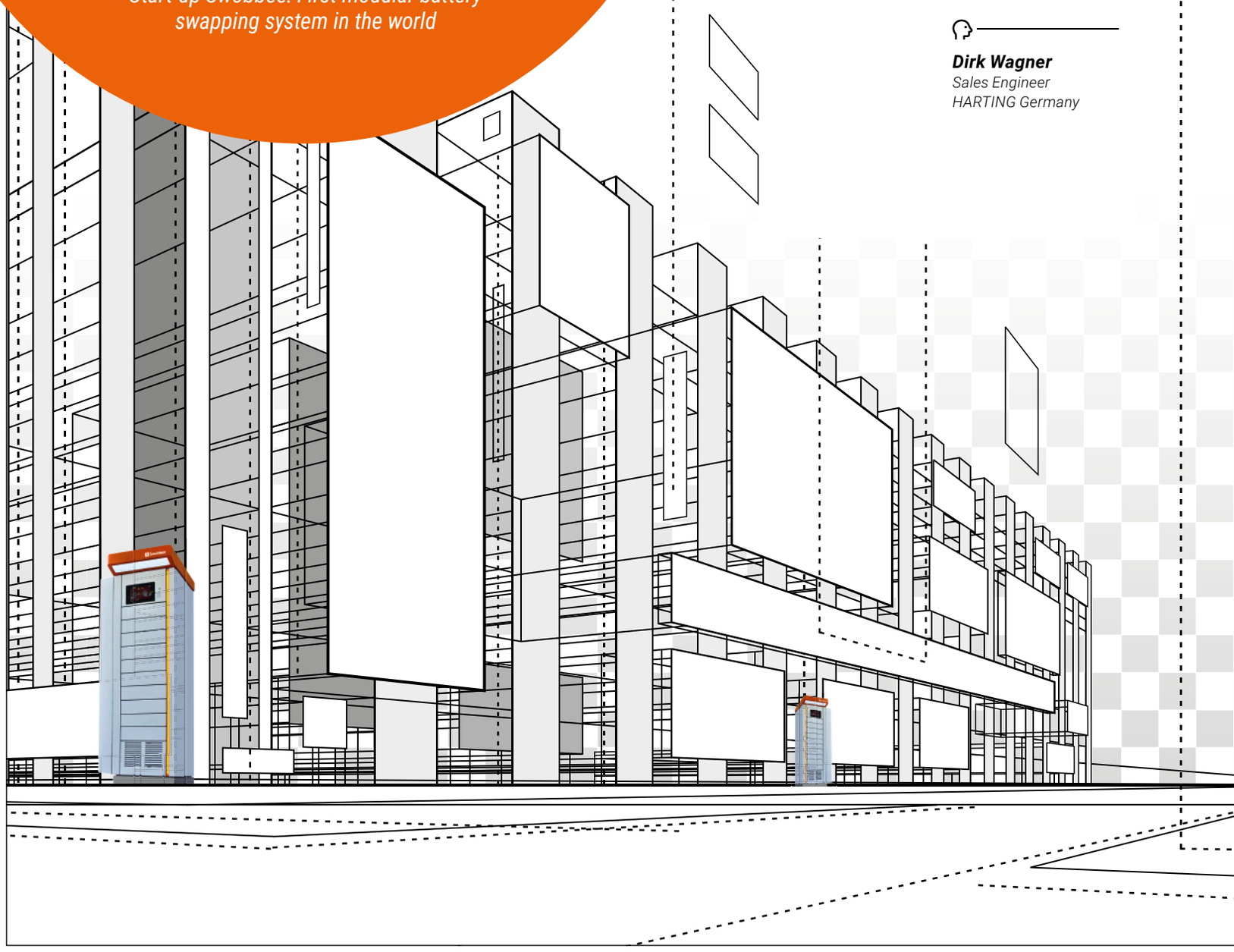
BLIND DATE

WITH GUARANTEED MATCH

Start-up Swobbee: First modular battery swapping system in the world

The Berlin start-up Swobbee is building a network of 'e-fuelling stations': users of small vehicles such as e-bikes, cargo bikes, e-mopeds and e-scooters can swap empty batteries for full ones – in less than half a minute, according to Swobbee. The stations have a modular design so that they can be quickly converted and expanded to charge new battery types. This is made possible by Han-Modular® connectors, among other things.

Dirk Wagner
Sales Engineer
HARTING Germany



The energy transition is one of the biggest global challenges, and the creativity of start-ups around the world is an important lever to drive the necessary reduction of our carbon footprint for a greener world. The founders of Swobbee are doing their bit: their network of e-charging stations specialises in the smaller e-vehicles. The company also makes its charging stations available to private companies that supply their micro EV fleets and those of their employees.

The battery charging station for micromobility

Swobbee emphasises the safety and cost efficiency of its charging solution, with the main focus on electric vehicles in the areas of sharing, logistics and quick commerce. Ultimately, the battery charging stations support the transition to sustainable inner-city mobility. The variety of battery types supported is unique: batteries for e-bikes, e-cargo bikes, e-scooters, e-mopeds etc. can be charged.

Swobbee relies on intelligent battery monitoring that collects data on battery health and charging safety. Customers can check the charge status of the batteries in the dashboard via their mobile phone, and real-time operation tracking is also possible. The app can also be used to reserve and replace batteries at the stations.

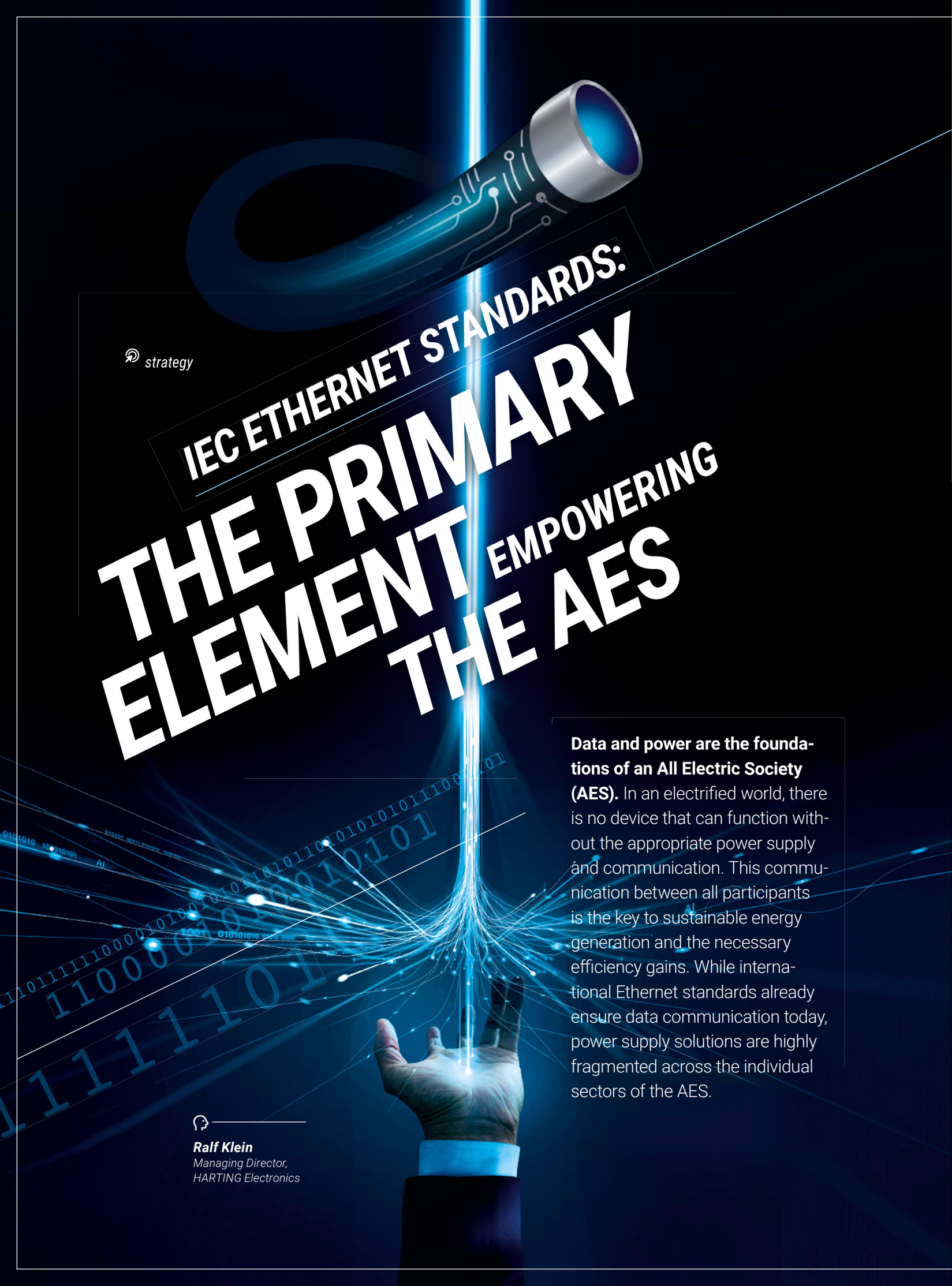
Modular design

As a start-up, you have to be very flexible in your development processes. 'There are many technical change orders and rapid product iterations,' reports Chief Operational Officer, Stefan von Wolff. Swobbee was therefore looking for a development partnership in which they could meet and exchange ideas with suppliers on equal terms. HARTING has obviously done this justice. Wolff speaks of a 'great' partner.

Not all interfaces in the charging stations are directly accessible; in some cases, access is restricted for safety reasons. This is why the Han-Modular® docking frame provided an ideal basis for the Swobbee solution. It enables 'blind' plugging without visual contact, making installation easier: both sides of the plug connection automatically move into the correct position for connection. The interface saves space because it enables the transmission of different media in one holding frame (power, data & signals). There are numerous expansion and upgrade options, as all connectors from the extensive Han-Modular® series fit into the docking frame.

Customer benefits at a glance:

- **High flexibility** due to the combination of power, data and signal in one unique interface
- **RReduction of production and installation costs** enabled by "blind mating" solution
- **Safe installations** assured by finger protected contacts
- **Easy & fast assembly** without special tools needed
- **Future proof and scalable** due to easy extension and upgrade



strategy

IEC ETHERNET STANDARDS:

THE PRIMARY ELEMENT EMPOWERING THE AES

Data and power are the foundations of an All Electric Society (AES). In an electrified world, there is no device that can function without the appropriate power supply and communication. This communication between all participants is the key to sustainable energy generation and the necessary efficiency gains. While international Ethernet standards already ensure data communication today, power supply solutions are highly fragmented across the individual sectors of the AES.

Ralf Klein
Managing Director,
HARTING Electronics

The reliable transmission of power and data plays a central role in the All Electric Society (AES). The vision of a fully electrified and digitalised society and the networking of industrial processes are key components in this context. This calls for uniform standards in the transmission of both lifelines in order to harmonise the individual sectors of the AES in an expedient way.

International IEC standards for Ethernet have long been established in data transmission, but this standardisation is still pending when it comes to power. The amount of data to be transmitted is growing exponentially and the power supplies must break new ground in terms of regenerative energy generation. The associated challenges for adequate connection technology are our HARTING's incentive.

Efficiency gains through data networking

The efficiency gains required for the AES can only be achieved through comprehensive and extensive networking. Energy generation and consumption must be seamlessly attuned to each other. Whether through the use of Ethernet via two, four or six copper wires - uniform standards for protocols, for the cable infrastructure and for interfaces have long since covered the major share of industrial communication.

More and more end devices are demanding innovative power solutions.

Ethernet standards are essential for models such as the Digital Twin and an Asset Administration Shell (AAS).

Just like the flow of data, energy transmission must also become convergent. At present, however, it is still being conceived as a unidirectional distribution. The data lifeline is becoming the leading element for energy on the course to standardised and networked solutions.

Integration of power and data

Connecting devices via mains adapters is time-consuming and inefficient. In fact, it is a step backwards to the power distribution of a pre-digital age. Meanwhile, more and more end devices are demanding innovative power solutions. Data is a role model here, as it always flows bidirectionally. Consequently, it was logical to consider the power supply from the data side, which gave rise to standardised systems such as Power over Ethernet (PoE) and Power over Data Line (PoDL).

Future-proof hybrid interfaces

In the case of devices with higher power requirements, it also makes sense to consider the power supply from the data side, because in a digitalised world, the data connection is becoming the key standard. This is creating new interfaces in industrial automation, in which data connectivity is being further developed around the topics of energy as part of a hybrid interface. Here, the "new" energy follows the data; the "new" energy is usually not always an AC grid, but potentially also DC voltage.

The first goal is to consistently place power under the control and management of data in order to achieve intelligent device power. And the decisive step to follow will be to offer one single cable for both lifelines – the One Cable Solution.

The future of data and power integration

The network connection and the power connection are equally important for the AES. The future is characterised by data, as is enabled by Ethernet and the standardisation committees. This effective approach will be supplemented in future by building a bridge to energy.

HARTING is involved when it comes to thinking about power for data transmission. This opens up scope for innovations. New interfaces and hybrid connection concepts are emerging, which are driving data and energy forward together.

The first goal is to consistently place power under the control and management of data in order to achieve intelligent device power. And the decisive step to follow will be to offer one single cable for both lifelines - the One Cable Solution.

STANDARDS FOR THE GREEN FUTURE

STRUCTURED CABLING AS A FOUNDATION OF

The All Electric Society promises a CO2-neutral future thanks to renewable energies. The key lies in connecting all energy producers and consumers by way of structured cabling – a standard that holds everything together.

THE ALL ELECTRIC SOCIETY

When we think of the All Electric Society (AES), we think of a future in which CO_2-neutral electricity is our primary source of energy. If we, as a global community, succeed in drastically reducing global CO_2 emissions, while at the same time increasing access to energy, this can promote economic growth and prosperity in all regions. If you ask people as to which areas of technology they associate with this transition to renewable electrical energy sources, many respondents will usually first think of concepts for sustainable energy generation or storage.

What often receives less attention is the no less important task of creating a link between the two – and quite literally. After all, sector coupling is a key concept for the success of the All Electric Society. The aim is to interconnect different sectors of the economy and society in order to increase energy efficiency and balance out fluctuations in the availability of renewable energy. Controllable consumers such as charging stations for electric vehicles, for example, can help to stabilise the entire energy supply.

The importance of standards in a networked world

This is where the concept of structured cabling - and therefore standards - enter the picture. Structured cabling systems make a valuable contribution to sector coupling by providing a flexible, scalable and future-proof infrastructure that is essential for the integration of different energy systems.

But why do we standards in the first place?

The topic of cross-organisational standardisation is very important for a technology company such as HARTING, which is also involved in industrial networking. Because standards mean compatibility, plain and simple. And this is essential to ensure reliability, security and interoperability.

THE ISO/IEC 11801

ISO/IEC 11801

If we look at data network technology, for example, including automation protocols in their broadest meaning, then the ability to exchange data is mandatory. Standards such as ISO/IEC 11801, ISO/IEC 14763-2 and TIA-568 define criteria for the installation, performance and testing of cabling systems. Today, almost all of our product standards are already linked to test standards. For example, our customers not only learn about its physical and electrical properties, but also how to correctly test an M12 connector according to CAT 5. Standards simply make good sense wherever, for example, different philosophies, products, manufacturers or protocols come together and interact – as is the case with structured cabling.

What is structured cabling?

The term structured cabling means nothing more than a standardised system of cables, connectors and associated components that enables a flexible and cost-efficient network architecture. This comprises various components: vertical cabling, horizontal cabling, patch panels, sockets and cable trays. Ultimately, the aim is to create a uniform and organised cabling infrastructure.

This generally consists of three hierarchical levels: primary cabling, secondary cabling and tertiary cabling, including passive components such as network cables, junction boxes, patch panels and network cabinets. At the same time, this infrastructure connects active components such as switches, routers or WLAN access points.

Going forward, this type of cabling then increases operational reliability through high-performance and redundant structures, for example. However, it also makes it easier for companies to simply expand or modify networks – without the need for major conversion work. In the long term, this enables companies to save costs and reduce potential downtime.

Structured cabling as an enabler of the AES

And this takes us full circle to the All Electric Society. The AES is based on the seamless integration of data through structured cabling. This in turn makes it possible to connect different industrial and technological sectors. However, it would not work without the secret star of this concept: ISO/IEC 11801.

The ISO/IEC 11801 success story

ISO/IEC 11801, originally intended primarily for structured building cabling in the LAN area, was developed around 30 years ago to bring together different communication protocols within buildings.

Structured cabling means that Ethernet can be used anywhere.

SUCCESS STORY

The standard, however, has continued to evolve and now covers a wide range of applications and fields of use - from office buildings to industrial plants and data centres.

If you look at its influence on the structured cabling, you can compare it to a person building a house. Building a house from scratch means having to design everything independently. At first it may be possible to cope on your own, but at some point more complex requirements are encountered such as statics, wind loads or the efficiency of thermal insulation. You will then need specialised experts and standardised components.

In the past, the cabling system in buildings was often designed individually for each and every application. Each manufacturer had its own protocols, cables and connectors that did not work together. This kind of individualism is comparable to the "house builder" who plans everything alone.

Today, however, standards such as ISO/IEC 11801 are firmly established. These standards ensure that certain parameters and components are specified in advance. This means that prefabricated, standardised parts can be used, similar to modern builders who have access to a variety of proven building components and techniques. This results in a more efficient, compatible and cost-effective implementation – both in construction and in the network infrastructure.

Comparable to the sustainably planned infrastructure of a house, which can last for 20-30 years, structured cabling guarantees a future-proof foundation that supports various applications and technologies.

An infrastructure for sector coupling

Structured cabling also promotes sector coupling by enabling the connection of different industrial and technological sectors. This coupling is essential for the target image of the AES. It ensures that energy flows and data streams can be managed efficiently between sectors such as energy, industry and transport.

We're not just talking about data and signals, but more and more about power in addition.

Data streams: Information and power in just one cable (SPE)

This data and energy can be transmitted using Power over Ethernet (PoE) in one and the same cable with four wire pairs. Thanks to the development of Single Pair Ethernet (SPE), however, transmission is now even possible by way of just one single twisted pair of wires. This not only reduces material costs and increases the range to up to 1,000 metres, but also enables use in environments where space and weight are at a premium.

We're not just talking about data and signals, but more and more about power in addition. SPE is a prime example of how structured cabling has been further developed to transmit both data and energy efficiently.

The actual challenge is to integrate this cabling into new application areas such as smart cities.

The future for and through structured cabling

And the future of structured cabling lies precisely in its ability to adapt to new application areas and technological advances. **The aim is to establish the technology in new areas such as smart cities, where it enables centralised infrastructures and consequently also the AES.** Stuctured cabling offers a flexible and future-proof solution for the continuously growing requirements for data and energy transmission in a wide range of sectors.

The actual challenge is to integrate this cabling into new application areas such as smart cities. This is where structured cabling becomes a critical infrastructure that enables data and energy to be managed efficiently and sustainably.

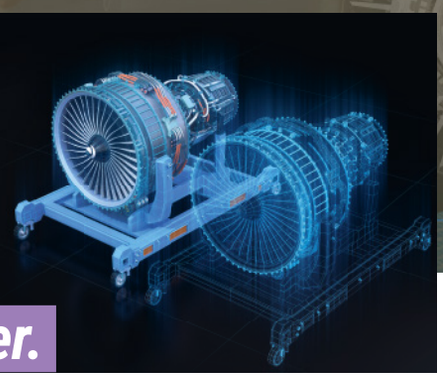
Rainer Schmidt
Business Development Manager, HARTING Electronics

"TWO DIGITAL TWINS THAT DON'T SYNCH ARE NO GOOD"

What makes a digital twin successful? Why can't we do without standards here too? Detlef Tenhagen, Senior Consultant – Technology Projects, answers these questions.

Andreas Huhmann
Strategy Consultant,
HARTING Stiftung & Co. KG

For us, the digital twin is a model that mutually depicts an asset, a process or an organisation with its properties in a timely manner.



tec.news: There are various definitions of a digital twin. How do you define the concept?
Detlef Tenhagen (DT):
For us, the digital twin is a model that mutually depicts an asset - i.e. a physical object -, a process or an organisation with its properties in a timely manner. They are based on internationally valid definitions from international standardisation bodies such as ISO or IEC, which work on the foundation of consensus. The IEC 63278 standard for the industrial digital twin is very important to us.

Why are standards important?
DT: They ensure interoperability between what were previously proprietary solutions and enable the cross-vendor exchange of products, tools and data. This is especially important for the integration of energy and data networks, which are the lifelines of our modern infrastructure. Without these standards, standardised protocols would be impossible, which would hamper efficiency and transparency and could obstruct developments towards sustainability.

Standards are therefore a necessary but not a sufficient prerequisite for interoperability. This particularly applies to the digital twin – because two digital twins that don't synch are useless.

And where does the Asset Administration Shell (AAS) enter the picture?
DT: It delivers significant benefits: Firstly, all products are united in real and digital form by the AAS. Secondly, they are readily available in the value chain in a timely manner. Thirdly, seamless communication is enabled. Fourthly – and this is very important – a single source of truth emerges about everything that concerns this product in its life cycle. This prevents duplicate data storage and inconsistent systems.

The concept of the meta model provides a standardised structure for organising data and enables the integration of heterogeneous data sources. It serves as the foundation for reference architectures, which in turn ensure the uniform application of standards.

If we want the Asset Administration Shells to communicate with machines, for example, the protocol layer remains unaffected. In this way it is possible to connect brownfield environments in the same way as it is possible with new systems in the greenfield. This is because the Asset Administration Shell is positioned on top of these

protocols as a layer, so to speak, stapling them and enabling what we have wanted for many years for Industry 4.0, which is networking towards so-called cyber-physical systems.

The concept of the digital twin is establishing itself as a future-proof model for product development over the entire life cycle. We see many demands coming up for companies that cannot be realised with proprietary solutions. One example is the recording of a Product Carbon Footprint (PCF) for a product along the entire value chain. The digital twin enables automation that was previously not possible. In this way, we can put an end to waste and measure the impact on natural resources.

What does this mean for HARTING?
DT: Above all, this means future security. We now have a standardised interface - in IT, but also in the areas of operations and logistics - for our asset administration shells. It is operational with sub-models that we define - based on the standards of consortia that the IDTA (Industrial Digital Twin Association) has created as a template. Our IT does not have to discreetly programme any interface software for the application software, for example for a PLM system such as Siemens Teamcenter that is currently undergoing its go-live with us. This trims our costs at the IT level.

And where do HARTING's connectors enter the picture?
DT: We rely on the digital twin throughout the entire life cycle of our connectors. This means that the administration shell is also used in the production process to control the production steps, as well as the entire digital twin by aggregating the individual administration shells. This generates the digital product pass and also determines the PCF for the connector type. The digital twin simplifies the development process for our customers and can be used for reuse or recycling at the end of its useful life, in other words, cradle to cradle.

What obstacles have to be overcome to achieve industry-wide standards?
DT: It is crucial that stakeholders do not singularise their interests. A common understanding is called for in order to avoid incompatible standards. In addition, the development of consensual standards is particularly important as they entail legal relevance and are recognised worldwide. The close cooperation between all relevant stakeholders in the standardisation process is important in order to avoid certain thought patterns and ensure broader acceptance.

Can bodies such as the Industrial Digital Twin Association (IDTA) help here?
DT: Yes they can, the IDTA has developed over 90 templates that support specific applications of the standards and promote the interoperability of systems. Through consortial standards, which are rooted in the legally binding consensual standards, they are creating a foundation for industry to cooperate worldwide.

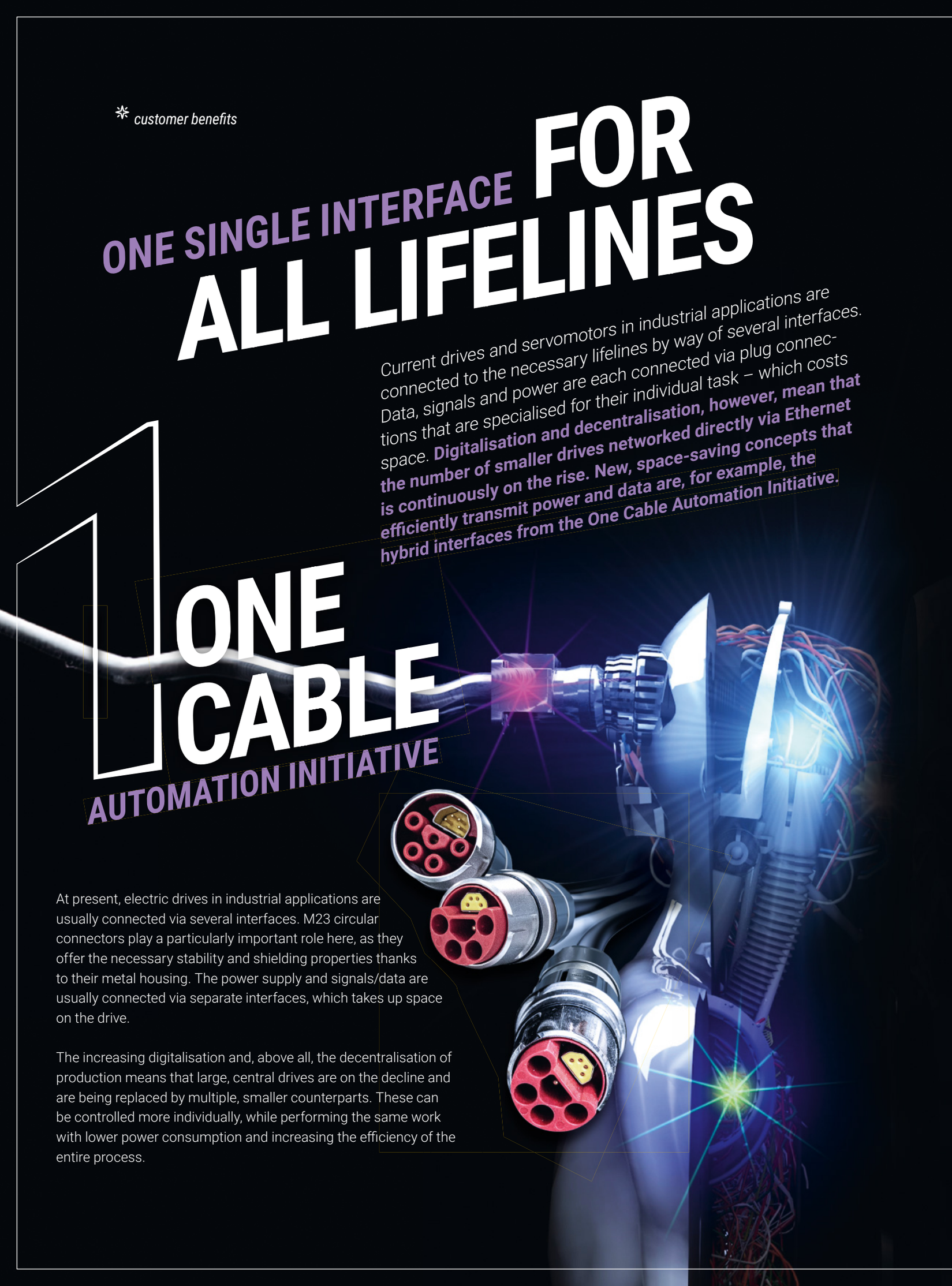
We rely on the digital twin throughout the entire life cycle of our connectors.

customer benefits

ONE SINGLE INTERFACE FOR ALL LIFELINES

Current drives and servomotors in industrial applications are connected to the necessary lifelines by way of several interfaces. Data, signals and power are each connected via plug connections that are specialised for their individual task – which costs space. **Digitalisation and decentralisation, however, mean that the number of smaller drives networked directly via Ethernet is continuously on the rise. New, space-saving concepts that efficiently transmit power and data are, for example, the hybrid interfaces from the One Cable Automation Initiative.**

1 ONE CABLE AUTOMATION INITIATIVE



At present, electric drives in industrial applications are usually connected via several interfaces. M23 circular connectors play a particularly important role here, as they offer the necessary stability and shielding properties thanks to their metal housing. The power supply and signals/data are usually connected via separate interfaces, which takes up space on the drive.

The increasing digitalisation and, above all, the decentralisation of production means that large, central drives are on the decline and are being replaced by multiple, smaller counterparts. These can be controlled more individually, while performing the same work with lower power consumption and increasing the efficiency of the entire process.

Rethinking connection concepts

Drive manufacturers are continuously developing their portfolio in this respect and are also focusing on the miniaturisation of their products. The space on drives is contracting, meaning that the connection concepts also need to be rethought. In addition to the power supply, drives require an additional control interface by which signals, BUS or Ethernet protocols are transmitted.

In order to save even more space in the future and reduce the complexity and expense of cabling, the focus is clearly on hybrid connection concepts.

In order to save even more space in the future and reduce the complexity and expense of cabling, the focus is clearly on hybrid connection concepts. These combine the supply of power and signals/data, thereby realising the idea of the One Cable Automation Initiative. The aim here is to ensure that each device is supplied by way of just one central interface, that would ideally be standardised. This saves time during assembly and eliminates the need for countless individual strands.

Transmiting power and signals/data simultaneously

The respective standards for hybrid circular connectors in various sizes are IEC 61076-2-117 and IEC 61076-2-118. The former describes metric solutions of various sizes (M „XX“), which offer a combination of screw and bayonet locking and the second standard (-118) describes the bayonet solutions (B „XX“). They all combine the simultaneous transmission of power and signals/data. There will be a different number of power contacts, combined with two or four control contacts, which transmit either BUS protocols, Single Pair Ethernet (SPE) or Industrial Ethernet.

Standardisation ensures cross-manufacturer compatibility. This creates trust among users who want to have access to second sources and do not have to rely on proprietary solutions.

Rainer Bussmann
Global Product Manager,
HARTING Electronics

PUBLICATION DETAILS

Published by: :
HARTING Stiftung & Co. KG, Margrit Harting,
Postfach 11 33, D-32325 Espelkamp,
Tel. +49 5772 47-0, Fax +49 5772 47-400,
Internet: www.HARTING.com

Responsible for the content:
Dr. rer. nat. Stephan Middelkamp,
Andreas Huhmann

Responsible in the sense of the Press Law:
Detlef Sieverdingbeck

Editorial team:
Vogel Communication Group: Christian Otto, Sebastian Human, Stefanie Michels, Benedikt Hofmann
HARTING: Rainer Schmidt, Jonas Diekmann, Volker Uphoff, Rainer Bussmann, Dirk Wagner

Overall coordination: Lars Kühme, +49 5772 47-9982

Design and layout:
trio-group I.AM communication & marketing GmbH,
www.trio-group.de

Production and printing: M&E Druckhaus, Belm

MIX
Paper | Supporting responsible forestry
FSC® C023618
www.fsc.org

Pictures

p. 1/40: Midjourney, GettyImages 987365514 | p. 2/3: HARTING, Shutterstock 2151870083 / 2152598171 / 2158324827 | p. 4/5: Shutterstock 203607874 / 1082677802 / 128496497 / 1658548102 / 1739052962 / 2185023595, HARTING, GettyImages 1835198684 / 176096435 | p. 6/7: Midjourney | p. 8/9: Shutterstock 697305988 | p. 10/11/12: Shutterstock 203607874 / 1082677802 / 1155152275 | p. 13/14/15: Shutterstock 145688102 / 148251818 | p. 16/17: Shutterstock 128496497 / 1658548102, Gunther Koschnick | p. 18/19/20: Midjourney, Shutterstock 2185023595, HARTING | p. 21/22: GettyImages 176096435, Shutterstock 2158324827, © KUKA Group | p. 23/24/25: Midjourney, Shutterstock 1205050099 / 725802025 | p. 26/27: Shutterstock 2167918217 / 2167918181, Christina Burgos Nittegaard | p. 28/29: HARTING, Shutterstock 13915660 / 2137804709, GettyImages 1446277571 | p. 30/31: Shutterstock 2479588763 / 2498468353 / 1034240188 | p. 32/33/34/35: Midjourney | p. 36/37: Shutterstock 1374752537 / 1739052962 | p. 38/39: HARTING, GettyImages 1835198684

HARTING TECHNOLOGY GROUP WITH NEW WEBSITE

Just went live – take a look!

Experience, configure, connect – visitors to the new HARTING website can expect a completely revamped online presence. The top priority here is to provide an efficient customer experience.

"We want to offer our customers and partners a web experience that is just as innovative as our solutions."

explains ***Andreas Wedel,***
Director Digital Transformation,
HARTING Technology Group

The new website is a central point of contact for all connectivity requirements.

Visit us at
www.HARTING.com

HARTING®
Pushing Performance
Since 1945