



2G  
Language



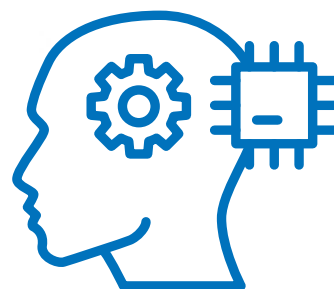
3G  
Data



4G  
Video



5G  
Industrial  
Internet of  
Things



6G  
Connecting physical, digital and  
human-biological worlds, AI  
holograms on mobile devices,  
massive use of AI and sensor  
technology

# VDE Policy Brief

Edition 3/2021

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# Initiate a new start-up era

5G is the dominant mobile communications standard of the 2020s. At the same time, research is being conducted into the 6th generation of mobile communications, which is expected to be ready for the market in 2030. Data can then be transmitted up to 100 times faster – the upcoming German government must now set the framework for a new 6G start-up era.

6G will trigger a surge in innovation in wide areas of the economy and society. In industry, for example, process flows can be further optimized. Care robots can take over important services and mitigate the shortage of skilled workers while maintaining the highest quality. In agriculture, 6G can help smart farming concepts contribute to greater sustainability and food security.

### Good starting conditions

Against this backdrop, the competition for 6G technology leadership is in full swing. Europe has the opportunity to assert itself: the breakthrough of 6G technology will be largely decided in radio access networks (RAN), which connect mobile devices to the internet – European companies have a RAN global market share of over 40 percent. In addition, European companies, together with universities and research institutions, are often innovation leaders. An important task for policymakers is to promote the transition to concrete 6G products and solutions. This cross-sectional task requires cooperation across departmental boundaries.

### Safer road traffic

With 6G, cars, cyclists, pedestrians and even drones can be detected and connected accurately and safely – autonomous driving is becoming a reality.



### Address key political issues now

To unleash the 6G innovation ecosystem, three other tasks are critical:

- **Promote flanking technologies:** the success of 6G depends on the development of other key technologies such as artificial intelligence (AI), microelectronics, and high-performance cloud services. Policymakers need to target research and development as well as investment in the relevant areas.
- **Design regulatory frameworks for the 2030s:** 6G applications will directly touch the lives of many people. Future regulations must ensure the protection of privacy, demand sustainable products, and aim for digital inclusion. A comprehensive agenda that needs to be addressed today.
- **Promote standardization:** 6G must be subject to the same standards worldwide so that 6G products and services work together seamlessly. The international standardization body 3GPP is particularly important in this context. Federal policy must support domestic companies in participating in it. Initiatives such as Open RAN also offer numerous opportunities and challenges that require coordinated action across the EU. It is a matter of nothing less than translating the best possible concepts into products.

### 6G focus project

What should the 6G world look like in the 2030s? The Information Technology Society in the VDE (ITG) is developing knowledge on this with experts from all disciplines – and is happy to make it available to political decision-makers.

➤ **VDE position paper**  
Joint Communications & Sensing

⬇ **Website**  
VDE Press Material

# Preserve Europe's technological sovereignty

Microelectronics will determine the future of climate protection technologies, mobility concepts, energy supply and much more. Governments worldwide are massively promoting their microelectronics. Distortions of competition are the order of the day.

Europe and Germany must finally wake up.

The U.S. government has announced plans to support its microelectronics industry with \$50 billion over the next few years. Similar double-digit billion sums are also being made available in South Korea. China wants to produce 70 percent of its own semiconductors by 2025.

### Urgent need for action

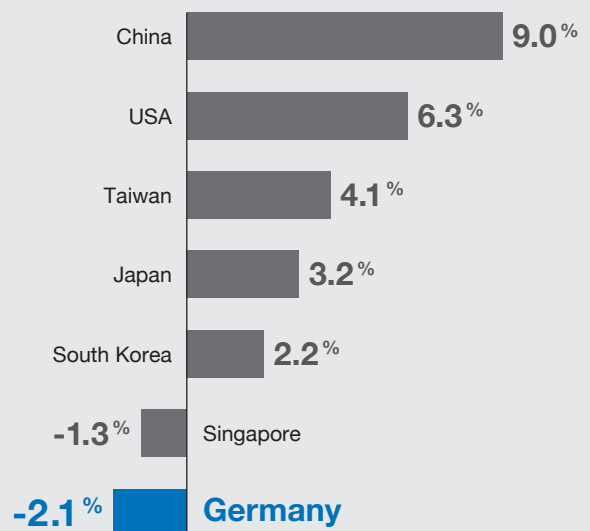
And Europe? Instead of expanding its global market share to 20 percent – as announced by the EU Commission in 2013 – it has shrunk to 7 percent. This means that the continent is losing irreplaceable know-how: not a single future technology is conceivable without microchips. Germany and Europe are becoming dependent on other regions of the world. This puts our technological sovereignty at risk.

Berlin and Brussels are increasingly aware of the danger. For example, the topic of microelectronics is high on the agenda of EU Commissioner Thierry Breton. The incoming German government has also defined technological sovereignty as a central field for the future. To safeguard its industrial policy interests, Europe urgently needs a master plan that addresses the following fields of action, among others:

- **Location quality:** excessive bureaucracy, restrictive antitrust policy and disproportionate tax burdens make investment decisions difficult. Germany and Europe must reposition themselves here.
- **Support system:** research and development in microelectronics are extremely dynamic. Accordingly, funding systems must make decisions more quickly at regional, national and European level and also implement them.

### Development of the top 7 semiconductor markets

Average annual growth 2015 - 2020



Source: ZVEI

- **STEM education:** Europe's electrical industry is experiencing an increasing shortage of skilled workers. The federal and state governments must broaden training in the so-called STEM subjects and make qualification opportunities more modern and in line with demand.

These issues must be addressed now. At the same time, this increases the chance that the chip companies Intel and TSMC will invest in Europe, as discussed, and thus give the microelectronics ecosystem a boost. In order to strengthen microelectronics in the long term, a broad dialog between science, research, industry and politics is needed – the VDE stands ready.



**VDE position paper**  
Hidden Electronics III



**VDE position paper**  
Hidden Electronics II



**Website**  
Press Material

## Rising demand for electricity

# Master the energy transition with AI

The SPD, Greens and FDP want to promote more renewable electricity, e-mobility and heat pumps. The problem that the grid infrastructure is not geared towards this new electricity world – AI-based approaches offer solutions.

Artificial intelligence (AI) is essential for the success of the energy transition. It can make a significant contribution towards increasing the interplay between volatile energy generation such as wind and solar power and rising energy consumption through intelligent automation. It can optimally integrate charging stations for millions of electric cars and hundreds of thousands of heat pumps into the power grid. It can also analyze enormous amounts of data for grid operation – to identify and master critical situations at an early stage.

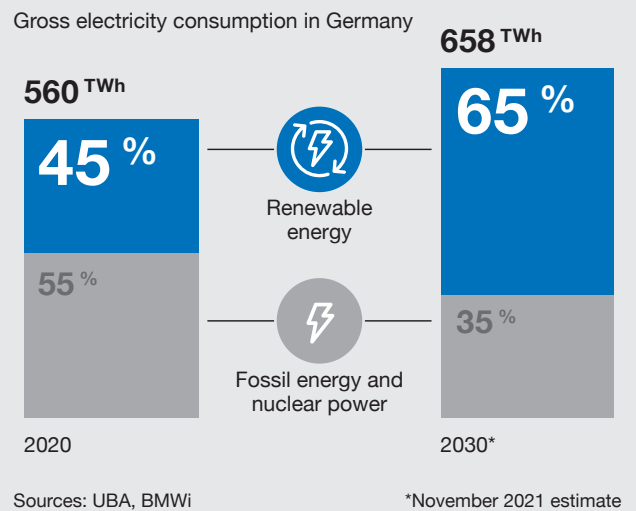
## Linking AI and the energy system

AI systems need political support for this:

- **Develop platforms:** platforms are needed in which various market participants build an AI ecosystem for the energy sector – the future German government should initiate this networking.
- **Drive standardization:** the energy industry is one of the critical infrastructures. Accordingly, AI applications must be subject to rules that guarantee their robustness. Standardization must be given top priority – also from an energy and climate policy perspective.
- **Promote acceptance:** AI applications are the subject of intense debate from an ethical and consumer protection perspective. Reliable AI quality testing must create security and acceptance. The VDE is currently establishing the “AI Quality & Testing Hub” in Frankfurt – the federal and state governments are called upon to support this globally unique project.
- **Adapt training:** electrical engineers and power engineers of tomorrow must be taught AI basics. The curricula are to be updated accordingly. At the same time, the state should promote appropriate continuing education programs to transfer knowledge into practice today.

Germany is implementing the decentralized energy transition more consistently than almost any other country. At the same time, domestic research institutions and commercial enterprises offer world-leading expertise in the field of energy technology and digitalization. This starting point must be used to help AI make a breakthrough in the energy sector – and to make “Green Energy Made in Germany” an export hit again.

### Green electricity is to be massively expanded – AI-based applications are essential to this end



### Whitepaper KI Energy

Over 300 standards identified

At the end of July 2021, VDE and DKE published the whitepaper “KI Energy.” The partners have identified over 300 standards that may be relevant for AI solutions in the energy sector – and have thus given the go-ahead for a technological leap.



### Website

DKE topic page



### Website

AI Quality & Testing Hub

For people

# Maintain sovereignty in biomedical technology

Biomedical technology is the number one driver of innovation in prevention, diagnostics and therapy. It saves lives and helps to mitigate or completely avoid severe courses of disease. This makes it indispensable for high-quality healthcare. All the more alarming, then, that Germany is in danger of losing out as digitalization advances.

Biomedical technology (BMT) made in Germany is losing importance on the global markets. The background: a lack of digitalization, the hesitant use of AI, overregulation and, in some cases, a lack of basic technologies at home. This is alarming news for Germany's industrial healthcare sector and its one million employees. What's more, BMT, which lies at the intersection of medicine, biology and engineering, involves the collection of sensitive data by the billions – data that would be better stored and analyzed in Europe.

## Keeping the connection



To guarantee this, Germany and Europe must maintain their technological sovereignty in the field of BMT. Two top issues are:

- **Data use despite data protection:** research institutes and BMT companies need data from mobile home care to “omics”-based systems medicine: they are the raw material for patient-centered care and enable completely new approaches thanks to technologies such as AI. What is needed is access to anonymized and pseudonymized care data that is controlled by law and legitimized by patients. At the same time, data management in the healthcare sector must meet the highest cybersecurity standards.
- **EU Medical Device Regulation (MDR):** the regulation defines requirements for the safety, documentation and tracking of medical devices. The effort involved is now overwhelming medium-sized companies in particular. Pragmatic solutions must be found for the national implementation of the MDR – otherwise established and safe medical devices will disappear from the market. The MDR should be revised promptly to ensure patient care and medical technology innovations in the long term.

BMT is of utmost relevance. Policymakers should create a task force and involve academia, industry, medicine and healthcare self-governance. The goal is to jointly maintain sovereignty around BMT in the future.

### Assessment level of sovereignty

Necessary and achieved BMT sovereignty level, example: networked infrastructure, digitalization and AI subarea

 required degree     existing degree

Research and development



Production



Operation



Usage



#### VDE position paper

Technological sovereignty in biomedical engineering



#### Website

VDE Press Material

## Shortage of skilled workers

# Finally attract women to electrical engineering!

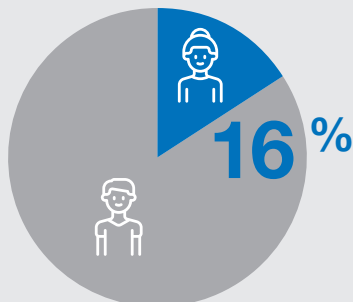
Germany has an increasing shortage of female and male electrical engineers. This is an alarming development for Germany as a technology location. The challenge is to attract talented people to the field – and to focus particularly on women.

Electrical engineering is still a male domain. With the increasing shortage of skilled workers, this is an untenable situation. Politics and business must now urgently forge new paths:

- **Using the world of film:** young people are also inspired by role models in films and series when choosing a career. Fictional formats such as “CSI,” which awakened the desire to become a pathologist, or, for the STEM field, “The Big Bang Theory,” play a special role here. Similar formats with female role models in the field of electrical engineering need to be developed. In order to reduce existing fears of contact on the part of filmmakers, policymakers should make use of their design options via the film funding agencies.
- **Dust off career portals:** the web portal of the Federal Employment Agency is a central point of contact for young people for career guidance. However, a generationally appropriate approach that is also aimed at a user experience is only taking place to a limited extent. Attractive formats that focus on women in particular are overdue.
- **Creative approach:** Universities must develop creative ideas to reach women. In the same way, companies are called upon to give women a special place at universities and career fairs.

### Women massively underrepresented

The proportion of women at the start of university in 2020 was just 16%. By comparison, it was still 23% in mechanical engineering and as high as 28% in civil engineering. Overall, the proportion of women was over 50%.



Source: Federal Statistical Office; own calculations

### Women's power in the VDE

**Heike Kerber** graduated with a degree in electrical engineering from Erlangen-Nuremberg – one of the first women ever to do so. Since 2008, she has been managing director of the network technology/network operations at VDE FNN forum. About this: “In the FNN team, we are five female engineers and seven male engineers. This means we are already raising the average in the industry. But the fact remains: we need more female network heroes.” [➤ VDE website: Network technology/network operations forum](#)

**Ulrike Jahn**, Senior Expert at VDE Renewables, receives this year's Becquerel Prize from the European Commission – the Oscar in the field of photovoltaics. Her recommendations on performance evaluation and risk analysis of solar plants in particular have earned her international recognition. [⬇ VDE press release: Becquerel Prize of the EU Commission awarded to Ulrike Jahn](#)

**Prof. Dr.-Ing. Martina Hofmann** has been VDE Committee Chairwoman for Studies, Career and Society since the beginning of the year. Her plea: “We need cultural change. I finally want a TV series with a cool female e-technician setting the tone.” She completed her doctorate at the TU Darmstadt. [⬇ VDE press release: Prof. Martina Hofmann takes over committee chairmanship](#)

**Jessica Fritz**, a computer science engineer, oversees the topics of human-machine interaction, trusted information and cybersecurity at VDE – and reaches over 30,000 contacts via her LinkedIn channel. She also regularly gives talks and is a guest on podcasts.

**Andrea Appel**, a trained traffic services clerk and environmental engineer, drives hydrogen issues at VDE. She is also involved in the agendas of the European Agenda Process on Green Hydrogen and the Hydrogen Research Network.

It is also clear that there is still something going on at VDE. We are working on it.

## Looking ahead

# What will the Earth look like in 2250 – and what needs to be done?

Climate change is one of the political mega-issues. Politicians are trying to counteract this development with ambitious targets. Government and industry are investing enormous sums to reduce CO<sub>2</sub> emissions. "Fridays for Future" are shaking society awake. But what possibilities do future technologies offer to enable human life even under adverse conditions?

Young and aspiring engineers from the VDE Young Net want to counter a sometimes distorted debate with something constructive. As part of the voluntary project "Earth 2250 – The Future of Our Planet," the team is initially assuming a worst-case scenario: In the year 2250, climate change and its consequences have progressed inexorably, and living conditions are extremely difficult. The key question is: Can the effects of climatic changes be compensated with technology?

And if so – what needs to be done to achieve this?

## Phase 1: Status quo

Since October 2021, a monthly lecture series has been taking stock of the situation. Experts from the Federal Environment Agency, Bielefeld University and the Advisory Board of the Institute for Climate Protection, Energy and Mobility (IKEM) have provided deep insights into environ-

mental conditions and challenges for energy supply. Until spring 2022, the thematic blocks raw materials, demographic development and mobility will be addressed. This concentrated know-how enables the Earth-2250 project to work scientifically and make realistic assumptions.

## Phase 2: Dialogue

The discussion will then be broadened in the coming year. The VDE Young Scientists will exchange ideas with young people from young political organizations and social groups in various workshop formats, supplemented by students from biology, medicine and sociology. The results of the work will be published in the follow-up. This combination of U30, interdisciplinarity, scientificity and a longer-term perspective is an absolute novelty in the climate policy discussion.

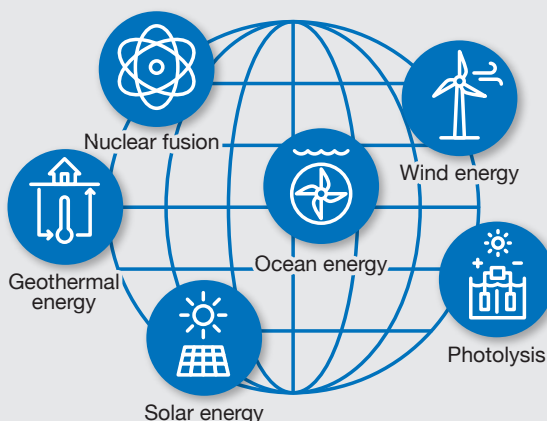
## Engineers for Future 24/7 – not just on Fridays

Electrical engineering already plays an important role in our lives today. In the future, it will even make a significant contribution to securing human life on earth. The next generation of VDE engineers is facing up to the special responsibility that this entails:

Engineers for Future 24/7 – not just on Fridays.

### Example of the energy supply of the future

In the second lecture series, Prof. Dr.-Ing. Jutta Hanson from Darmstadt Technical University outlined her perspective on energy supply in 2250. Key message: as decentralized as possible, as centralized as necessary – with new types of generation structures and high-performance transmission and distribution networks linking the world's regions.



[Website](#)  
Earth 2250

# VDE – the technology organization



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## Facts and figures

	Founded:	<b>1893</b>
	Headquarters:	<b>Frankfurt</b>
	Employees:	Worldwide <b>2,000</b>
	Volunteer experts:	More than <b>100,000</b>
	Locations:	Worldwide over <b>60</b>
	Research and funding projects:	<b>175</b>
	Events per year:	Over <b>1,600</b>
	Product inspections per year:	<b>25,000</b>
	Electrical products bearing VDE mark:	<b>Billions</b>
	Norms and standards:	Over <b>3,500</b>