31,000

skills shortage

There will be a cumulative shortage of approximately 31,000 electrical and information technology engineers by 2029 – solely due to an increasing number of retirements and stagnating graduate numbers. It's time to act! More on this on page 2.

VDE Policy Brief

Edition 2/2026

VDE Policy Brief online

VDE

Shortage of skilled workers

Threat to technological sovereignty

AI applications, digitalization, and the energy transition cannot be realized without electrical and information technology engineers. The problem: the number of students dropped dramatically between 2011 and 2021 – a disastrous development in terms of technological sovereignty.

Across Germany, there is currently a shortage of about 5,000 electrical and IT professionals per year to replace those retiring – and the trend is rising sharply. As a result, fewer and fewer people are studying electrical engineering at German universities: Over the past decade, the number has fallen by about a third. Students from all over the world are preventing this negative trend from becoming even more drastic. As a result, the proportion of international first-year students exceeded the 50 percent mark for the first time in 2025. However, internationalization poses other risks. This is particularly true for the defense sector – see VDE Policy Brief 1/2026.

Security risk from espionage

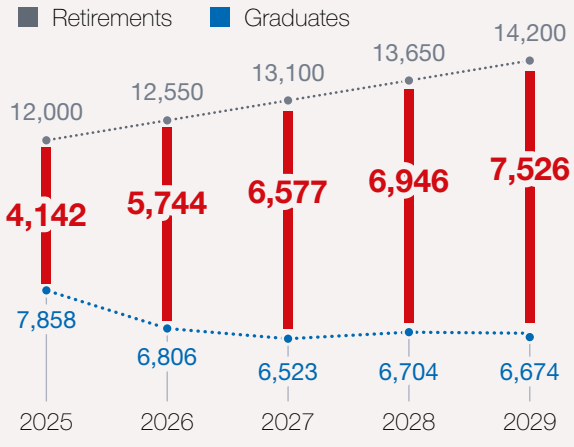
It is important that Germany is – and remains – an attractive destination for international students. Companies are desperately seeking young people with a passion for electrical engineering or information technology.

This development presents enormous challenges. First, from a security policy perspective: in May 2026, the federal public prosecutor's office arrested suspected international spies who were allegedly tasked with spying on researchers at military-related academic departments. In addition, government scholarship recipients from certain countries are required to disclose information to their home countries and are subject to political pressure – for example, regarding technical knowledge of technology with military applications, such as electronics, sensor technology, and communications technology for drones or aerospace. Second, economic factors: many international graduates return to their home countries after completing their studies – for example, due to a lack of contacts with German companies or general difficulties with the German language. Key tasks from VDE's perspective:

- **Harness domestic potential:** universities and the federal states must continuously promote higher education and allocate significantly more resources to reaching out to young people in a way that appeals to them. Above all, it is essential to specifically attract young women to the fields of electrical engineering and information technology. Their share currently stands at only 13 percent – the lowest among all engineering disciplines.
- **Retain international talent:** universities should expand language support and provide structured career entry opportunities, particularly at small and medium-sized enterprises.
- **Focus on strategic recruitment:** young talent should be specifically recruited from friendly democracies, such as EU and Mercosur countries. This also reduces dependence on individual countries of origin.
- **Prioritize security:** a blanket restriction on the admission of government-sponsored students would be going too far. However, in security-relevant fields – and this applies to many areas of electrical and information technology – restrictions must be imposed on government-sponsored students from security-critical

Dramatic shortfall by 2029

The cumulative gap between the number of students reaching retirement age and the number of graduates in electrical and information technology will grow to nearly 31,000 by 2029.



Source: VDE

VDE Info
Universities: electrical and information technology 2026

Article from VDE Policy Brief 1/2026
The defense sector as a workplace

Control systems in low-voltage applications

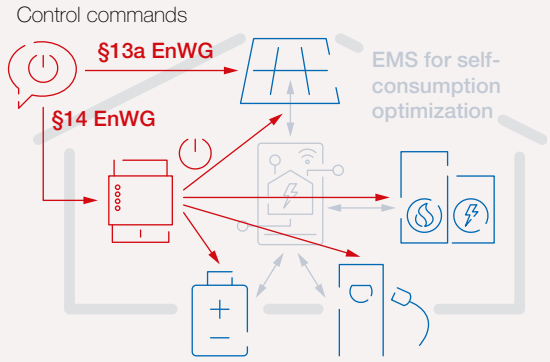
Establish a clear set of rules

High-voltage power lines have long been the focus of public attention in connection with the energy transition. However, the success or failure of the energy transition will largely be determined at the low-voltage level. This makes it all the more important for policymakers to finally enable efficient management of the power grid.

More and more households are generating electricity with their photovoltaic systems and feeding it into the distribution networks. In addition, hundreds of thousands of new wall boxes, heat pumps, and battery storage systems are being connected across Germany every year. The Forum for Grid Technology and Grid Operations within VDE (VDE FNN) develops authoritative regulations that contribute to a stable frequency even during the energy transition. At the same time, legislators are called upon to act. A key task is to enable distribution system operators (DSOs) to efficiently curtail decentralized systems under 100 kW or reduce power consumption by end-use devices in critical grid situations – for example, when too much electricity is fed into the grid or consumed in certain regions.

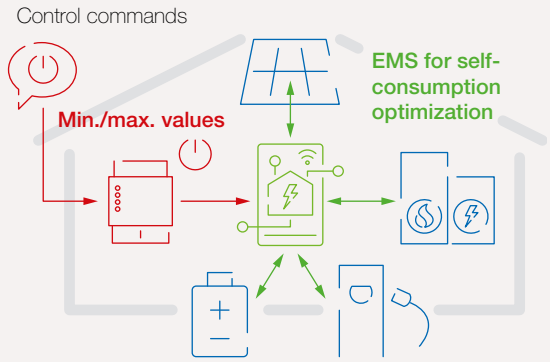
Current situation

Different control regimes



FNN target scenario

Control at the grid connection point



Put an end to uncertainties

The background to this is that Sections 14a of the Energy Economy Act (EnWG) (consumption), 13a of the EnWG (generation), and Section 9 of the Renewable Energy Sources Act (EEG) (feed-in) currently contain different and, in some cases, contradictory regulations regarding control within distribution networks. For example, distribution network operators (DNOs) are already permitted to control consumer devices such as wall boxes at the grid connection point – a sensible regulation. When it comes to generation, however, distribution network operators (DNOs) must intervene directly at the photovoltaic systems. The varying effects of control measures on customer installations result in additional work, increased complexity, a heightened susceptibility to errors, and uncertainties for both distribution network operators and operators of renewable energy installations. Ultimately, the current legal regulations mean that prosumers are unable to use their own electricity during periods of grid congestion.

Focus on grid connection points

The federal government is therefore called upon to provide clarity before the end of this year and to focus the impact of regulatory measures on both consumption and feed-in at the grid connection point. Here are the key advantages:

- A standardized approach reduces complexity and enables the rollout of control measures across different case classes.
- The technical effort is limited to a level that is feasible and economically viable for all parties.
- Installers can follow a clear set of guidelines.
- Solar power system operators can continue to use the electricity themselves even when output is curtailed.

VDE FNN Position Paper
Focusing control on the grid connection point

VDE FNN Initiative
Vision for control

Article from VDE Policy Brief 1/2026
Curbing cost increases in distribution networks

Article from VDE Policy Brief 1/2025
Profitability is achievable

Data centers for artificial intelligence

Accelerate the adoption of highly efficient solutions now

Europe must catch up with U.S. companies when it comes to AI. Therefore, the EU intends to significantly strengthen domestic AI applications. From VDE's perspective, this is the right approach. What is often overlooked is that Europe must also urgently expand its high-performance data centers to support the widespread use of AI.

The new VDE Info publication from the VDE Information Technology Society (VDE ITG) outlines possible solutions. Data centers form the backbone of the digital infrastructure. Among other things, they enable data processing, cloud services, and AI applications – the latter of which are causing a massive increase in the demand for computing power. Consider the Meta Group's so-called High-Performance Computing Data Center (HPC DC) in Louisiana, which is projected to require five gigawatts of electricity. That is seven times the average continuous power output of the city of Munich.

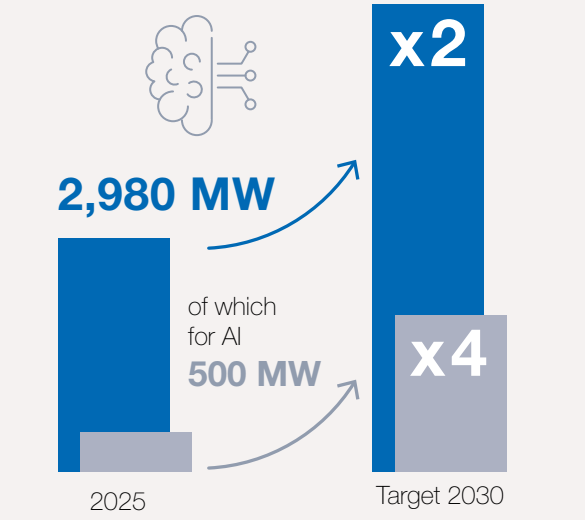
Greater efficiency is feasible

The good news: high-performance data centers are being used under heavy load for generative AI applications. There, computing is heavily optimized for high data throughput. As a result, HPC data centers not only deliver significantly more computing power per kilowatt-hour but can also reduce energy consumption for cooling by more than 20 percent in some cases with the help of AI applications. Such facts are of the utmost importance for political debates. The goal is to convince the public of the need for modern data centers in Germany and to pursue solutions that comprehensively contribute to the common good. At the same time, it is important to provide companies with reliable prospects for investing in AI infrastructure. Key topics are:

- **Identify location advantages:** Metropolitan areas are only partially suitable for the development of new HPC data centers due to limited building space and potential grid bottlenecks. Instead, the focus should shift to medium-sized cities. VDE highlights the grid connection requirements for data centers.
- **Pick up the pace:** The construction of industrial facilities such as HPC data centers affects many people. Policymakers must prioritize the relevant planning and permit procedures, taking technical requirements into account. VDE is available to provide expert assessments of specific plans.
- **Expand power grids:** Modern data centers require a great deal of electrical energy. The grid capacity required for this must be determined jointly by policymakers and utility operators. The need for optimization extends beyond the technical aspects. Policymakers need to work more closely with network operators and planners on the construction of data centers in order to drive expansion forward.
- **Reward flexibility:** Data center operators should receive incentives to manage their electricity demand flexibly. This relieves the strain on power grids while ensuring security of supply.

Federal government expansion targets

IT connected load of data centers



Source: BMDS

VDE Info
Grid connection for AI

Article from VDE Policy Brief 1/2025
IT as the driving force behind the digital society

Article from VDE Policy Brief 4/2024
ITG: We're building the future

Connected medical technology

The driving force behind digitalization

The healthcare system must become more digital and data-driven. For reasons of efficiency as well as to ensure that health care is kept up to date. Yet the most valuable source of data currently remains untapped: the devices at the patient's bedside. Policymakers must now create the right framework conditions for connected medical technology.

From monitoring devices to early warning systems

Modern medical devices can continuously collect data, process it locally, and, increasingly, interpret it with the help of AI. When properly networked, these devices form the foundation for better care. Take for instance the early detection of sepsis in a hospital: monitors, ventilators, and infusion pumps continuously measure patients' heart rate, blood pressure, oxygen saturation, and temperature. Through their interaction, an AI-supported early warning system can detect a disease before it becomes clinically apparent. The approach also makes economic sense: depending on their level of IT maturity and process optimization, investments in interfaces and infrastructure pay for themselves for hospitals within six to 36 months.

Medical technology in Germany

Companies*	1,500
Share of SMEs	93%
Employees	210,000
Value creation	€19.7bn
R&D quota	9%

*with more than 20 employees; Source: BVMed

Potential savings in the healthcare sector

through AI-supported diagnostics

Source: BDI/Prognos

What's holding back interconnectivity

However, despite a high level of technical infrastructure, connectivity remains fragmented so far. Devices from different manufacturers typically use interfaces that do not meet interoperability requirements. This is a classic chicken-and-egg problem that policymakers must resolve: there is a lack of demand from hospital operators, who in turn lack the specialized personnel needed for digitalization. The inevitable consequence is that data collected by individual devices remains unused. Added to this are structural challenges such as unresolved liability issues or a lack of investment incentives for hospitals. Legislators are called upon to support interconnected medical technology and improve patient care. Five important tasks from VDE's point of view:

- **Establish interoperability:** Existing standards such as HL7 FHIR and ISO/IEEE 11073 enable interconnected medical technology. They must be considered minimum requirements for future procurements. The digital transformation of healthcare facilities themselves must be facilitated.
- **Promote investment:** Hospitals need funding, particularly for networks, servers, cybersecurity, and the procurement and integration of medical technology. Such funding programs should be designed for the long term.
- **Clarify AI issues:** AI-based medical devices require guidelines on issues of accountability, validation, and liability. Appropriate regulation provides certainty for manufacturers and users.
- **Expand training opportunities:** Medical technology, IT, nursing, and clinical staff need ongoing training and the flexibility to set up and operate digital systems safely.
- **Create incentives:** Hospitals that successfully implement interoperability, standardized, and digital processes should benefit financially.

VDE Position Paper
Connected and smart medical technology

Article from VDE Policy Brief 1/2025
Enabling better healthcare

Decommissioning renewable energy facilities

Standardization puts policy into practice

The first generation of wind and solar power plants will soon need to be replaced. This releases significant material flows. Policy goals such as the circular economy and the strategic extraction of raw materials from recycling lead the way. The procedures for this are defined by international standards, which directly incorporate German preparatory work.

Currently, there are about 29,000 onshore wind turbines connected to the grid in Germany, about half of which are more than 15 years old. Many of the PV systems from the first solar boom in the early 2000s will also soon reach the end of their useful life. In addition to the Building Code and the Federal Immission Control Act, the five-tier waste hierarchy of the Circular Economy Act sets the framework for the decommissioning of wind turbines. The technical specification IEC/TS 61400-28-2, currently under development, provides applicable procedures – serving as a bridge between German law and international practice.

German pioneering work becomes an international standard

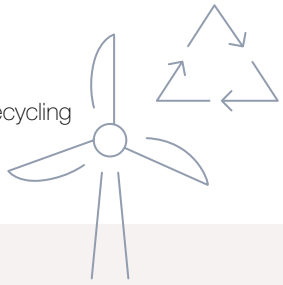
The groundwork laid by German standardization experts, with structured recommendations for the decommissioning of wind turbines, forms the basis. International standardization also builds on this groundwork. The national guidelines are transformed into an internationally agreed-upon specification – with a common basis for terminology and procedures, comparable documentation, and alignment with international certification. This reduces friction losses in cross-border recycling chains.

Repowering, reusing, and recycling

At the end of a turbine's life, the international specification IEC/TS 61400-28:2025 supports the decision between continued operation, service life extension, and repowering – the replacement of old turbines with more powerful new ones at the same location. Reuse takes precedence over recycling: turbines – formalized in the photovoltaic sector through the Waste Electrical and Electronic Equipment (WEEE) Directive – or components are put back into service elsewhere. When it comes to recycling, over 90 percent of the materials in wind turbines can be reused: the rotor blades, for example, are used as aggregate in the cement industry, and the permanent magnets provide the rare earth elements neodymium and dysprosium. For PV modules, up to 95 percent is considered recyclable. Key raw materials here include silicon, silver, and copper, among others. A comprehensive IEC framework is being established for wind energy, while the rules for photovoltaics are defined by the Waste Electrical and Electronic Equipment (WEEE) Directive.

This benefits all parties: the orderly recovery of materials reduces the environmental burden and provides policymakers with predictability. What was once purely a waste disposal task is now becoming a circular-economy-oriented phase of plant management. This directly contributes to the EU's goal of sourcing one-quarter of its strategic raw material needs through recycling within Europe by 2030.

VDE Technical Paper
Repowering, reusing, and recycling wind and PV systems



Standardization ensures a circular economy – example: wind turbine

Waste hierarchy (Section 6 KrWG)	Technical Specification (IEC/TS 61400-28-2)
Avoidance	Component testing and evaluation: generator, gearbox, tower, rotor blade
Preparation for reuse	Reuse/repurposing: continued use in other industries
Recycling	Recycling: steel, concrete, generator, gearbox, tower, GRP/CFRP, rare earth elements
Other forms of recovery	Material/thermal recovery: e.g., resin components of the rotor blades
Disposal	Disposal: non-recyclable residues

VDE – the technology organization

Your contact

Markus B. Jaeger
VDE Global Head of Political Affairs

VDE Verband der Elektrotechnik
Elektronik Informationstechnik e.V.
Bismarckstraße 33
10625 Berlin

Cell +49 171 7631986
markusb.jaeger@vde.com

Contact details as vCard:

Facts and figures

Founded	**1893**
Employees	worldwide **2,000**
Honorary experts and members	**100,000**
Sites	worldwide over **60**
Research and funding projects	over **175**
Events per year	over **1,600**
Product inspections per year	**25,000**
Electrical products bearing VDE's certification mark	**billions**
Norms and standards	**3,500**

Publisher
VDE Verband der Elektrotechnik
Elektronik Informationstechnik e.V.
Merianstraße 28
63069 Offenbach am Main

Legal notice
www.vde.com/impressum

Editorial deadline
July 2, 2026

Agency partner
Köster Kommunikation