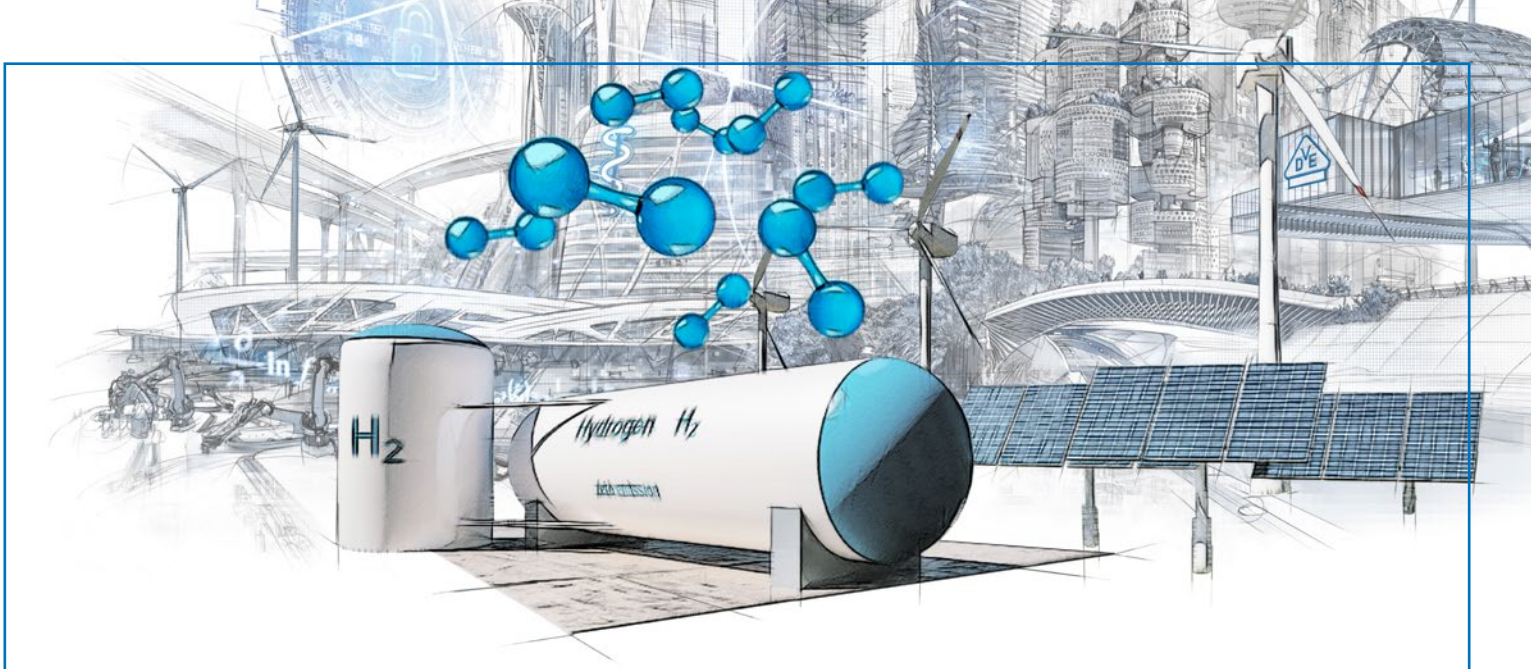


Smart meters in Germany

2022: **0.1 million**

2030: **~48 million**

Sources: Federal Network Agency, German government

Enabling the smart meter revolution

The energy transition also means replacing electricity meters throughout Germany with smart meters as far as possible within a few years.

VDE Policy Brief

Edition 1/2023

VDE Policy Brief online

VDE

Smart meters

The Bundestag must act – now

The good old electricity meter will soon become obsolete. Intelligent metering systems – so-called smart meters – are to be installed across the board in just a few years. The Bundestag is currently debating the legal framework. And it must take urgent action.

There is agreement across party lines that the energy transition will only succeed if the grid becomes more digital and smart meters develop their full potential across Germany. The present draft law for relaunching the digitalization of the energy transition is insufficient for this in various respects. Two key examples:

1. Enabling coordination

One of the core tasks of smart meters is to control power generation and consumption in a decentralized manner. They are the hinge, for example, for using electricity from one's own photovoltaic system on the roof either for the wallbox in the garage or feeding it into the grid of the electricity provider. Only in this way is it even conceivable that Germany will increase the share of renewable energies in gross electricity consumption from its current level of 46 percent to 80 percent by 2030 whilst operating the grids efficiently.

The exciting question is who will have access to the smart meter data and coordinate the higher-level control of electricity flows. This coordination function is of the utmost importance, for example, in order to identify power bottlenecks at an early stage and respond to them proactively, thus ensuring a highly efficient supply. The draft law provides for metering point operators to perform this function. This is a fatal flaw: metering point operators cannot and must not assume this function. If this remains the case, the energy transition in Germany will fail! It is imperative that the legislator designate the network operators, who are the only ones with a local overview of consumption and generation, for the coordination function.

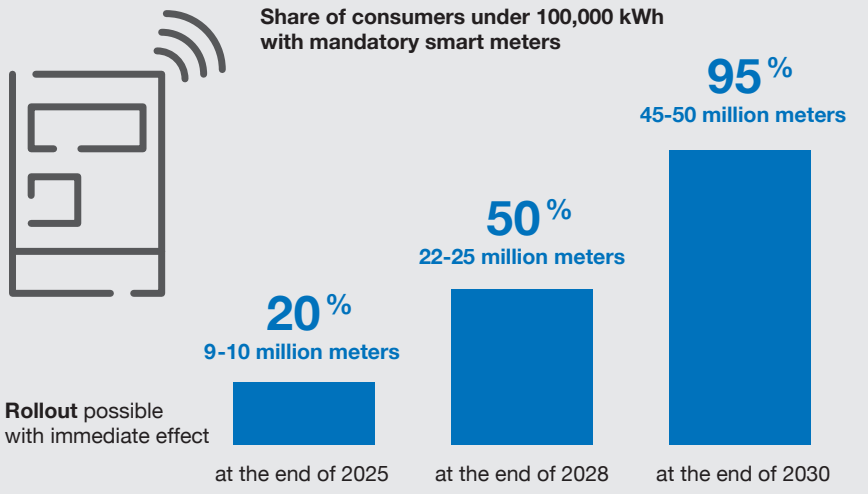
2. Dust off the calibration law

The draft law completely ignores the issue of contemporary calibration law. This means that digital smart meters will be subject to the same calibration processes that applied in the early years of the Federal Republic. This is absurd. Here is a specific example: If one of the four smart meter manufacturers wants to install a security update at short notice, it must first obtain approvals from 13 different state calibration authorities. This takes time, increases risks and costs – and prevents the rollout of smart meters.

If coordination and calibration law are not properly regulated in the coming weeks, the success of the energy transition will be threatened at its core. Future topics such as comprehensive sector coupling and the so-called data room architecture also depend on it.

Smart meter roadmap needs appropriate framework conditions

The German government has presented an ambitious rollout roadmap. By the end of 2025, 20 percent of households and commercial enterprises are to be equipped with smart meters – incentives and a target-oriented framework are essential for this.



Source: German government, own calculation

DKE statement
Restarting the digitalization of the energy transition

Website
VDE Energy

Website
VDE FNN

Power supply in the new era

Strengthening resilience

The power supply must be made considerably more resilient! First, the risk of sabotage is increasing massively, see the Russian espionage against North Sea wind turbines. Secondly, the probability of weather extremes is increasing, see the 2021 flood disaster in the Ahr Valley including devastation of the power supply. One thing is clear: if the power supply collapses over a wide area, human lives are at risk.

How should the power grids be designed so that a minimum supply is possible even in the event of a disaster? Answers are provided by decentralized approaches that open up new options in the course of the energy transition. Island grids – also known as microgrids – comprise local power generation plants such as solar and wind power, energy stores and a defined number of power consumers such as households or companies.

Enabling self-sufficient supply

The key here is that if there is a failure in the general power grid, the island grids can disconnect and act autonomously. At the same time, power availability must be controlled in a risk-appropriate manner: within the island grid, large consumers can be switched off so that important basic functions such as water supply and telecommunications are reliably supplied with electricity. A look at Japan – where the concept has been pursued in some regions for some time – shows the potential: here, microgrids secured the supply of communities in the immediate vicinity of the Fukushima nuclear power plant, even though the accident there led to a complete power outage.

VDE drives forward development

We are driving forward the topic of resilience in the power grid sector at VDE on a massive scale and are clarifying key issues for Germany: How must microgrids be planned and monitored? How can they be optimally integrated into the general power grid and what should the interfaces look like? The relevant standardization organization, the DKE, which is supported by VDE, is working on corresponding concepts with the technical level of the Federal Office for Civil Protection, among others.

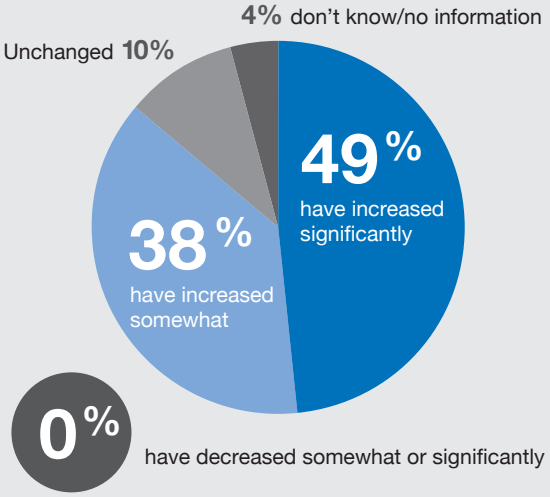
What can policymakers do?

First, they should design the regulatory framework in such a way that microgrids can be integrated as flexibly as possible into existing power grids.

Secondly, pilot projects, such as those currently being pursued in numerous municipalities, should be specifically promoted. This is not just about resilience: microgrids offer municipalities with an above-average share of renewable energy generation the opportunity to operate even more economically.

CRITIS increasingly under pressure

Critical infrastructures (CRITIS) such as the power supply are increasingly threatened by cyberattacks. Development of the CRITIS sectors according to companies' assessment over the past twelve months:



Source: Bitkom Research 2022; does not add up to 100% due to rounding

VDE DKE website
Microgrids make an important contribution towards increasing resilience

VDE SPEC
Cybersecurity for communication protocols

Article from the Policy Brief 1/2022
Lesson from Putin's war in Ukraine

VDE study “The future of energy”

Shaping 100% renewables

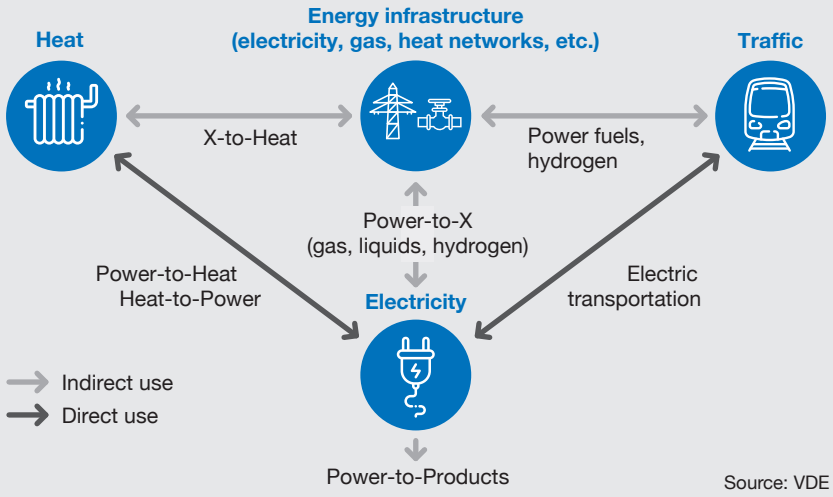
Anyone who wants to politically shape the path to a climate-neutral, secure and affordable energy supply needs a target perspective and clearly defined milestones. As part of a current study, VDE is providing essential impetus – and helping to ensure that Germany can maintain its role as a leading industrial nation.

Connecting the electricity and gas grids

100 percent renewables are possible by 2045/2050! Supply bottlenecks during a “lull in wind generation” can be avoided, given the following provisos: first, the massive expansion of solar and wind energy. This requires regulatory relief, among other things, with regard to distance regulations. Second, the development and use of various storage technologies. For example, surplus electricity can be converted into green hydrogen, stored and converted back into electricity, or used in other ways. One thing is clear: renewable electricity and renewable gases will together form the basis of the energy system.

Driving forward sector coupling

In the energy system of 2045/2050, the electricity, heat and transport sectors will be interconnected. This requires overall system planning and optimization.



Source: VDE

Driving digitalization forward

The energy system of the future will become more diverse. The number of small generators such as rooftop PV systems will grow massively. What is important for the power grid is that in a locally or regionally limited area – or what is referred to as an energy cell – power generation and consumption must be balanced as flexibly and dynamically as possible. Digitalization and highly automated control are essential here. This requires further technical developments as well as changes to the regulatory framework.

Enabling decentralization

Market structures must change radically and provide space for new business models and price structures. The end consumer will become an energy producer and contribute towards ensuring stable power grids. In order to reconcile security of supply and economic efficiency, policymakers must introduce meaningful market incentives. This includes flexible remuneration, especially for electricity generation and storage.

Creating a coordinating institution

Only an overall systemic view can create lasting solutions – this applies to no policy-related field more than energy supply. Electricity, heat and transport must be considered collectively. But this is not a matter of course: a coordinating institution is needed to manage the energy transition comprehensively.

System stability roadmap

By the summer of 2023, the German government intends to develop a roadmap for system stability together with key stakeholders. With VDE’s participation, the groundwork will be laid for an electricity grid based on 100 percent renewables. For details, see the Policy Brief 4/2022.

VDE/ETG study
The future of energy

Website
Press release

Website
VDE ETG

Standardization

A geopolitical instrument

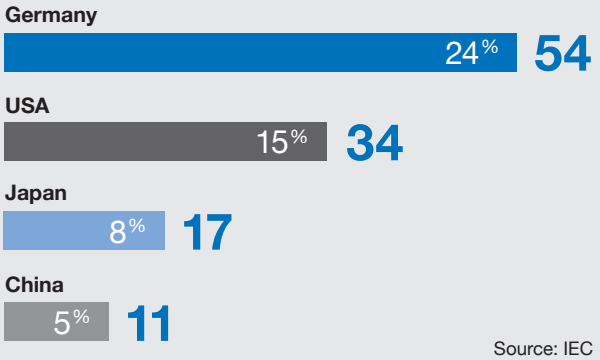
In this country, standardization has for a long time been regarded as a purely technical process. This is far from the truth: those who can set standards worldwide define the technology markets of the future and enjoy competitive advantages. Germany and Europe have now recognized this – and the standards organization DKE, which is supported by VDE, is an important partner in this process.

The new attention paid towards standardization has a lot to do with China. In line with its "China Standards 2035" strategy, the country is occupying more and more central positions in international standards organizations in order to shape global markets. To this end, the state is devoting considerable financial and human resources. This is a game changer: until now, it was mainly companies that sent employees to international meetings around the world, sometimes for several weeks a year, at their own expense.

China massively expands influence in standardization

The International Electrotechnical Commission (IEC) is the key organization for the worldwide standardization of electrical and information technology equipment. Germany is still the leader with the DKE, but China is gaining massive influence, especially in future technological topics.

Chairmanships of IEC Technical Committees



Source: IEC

High-Level Forum launched

The EU now wants to counter this trend. Three key objectives of its 2022 standardization strategy are: strengthen Europe's role in world trade, promote innovation, and consolidate the single market. An initial milestone has now been reached with the launch of the High-Level Forum in January 2023. At the invitation of the EU's Internal Market Commissioner Thierry Breton, 50 top representatives from business, politics, society and standardization met. The core task is to anticipate standardization priorities – for example, in the areas of artificial intelligence, microchips and green hydrogen – and to effectively represent European interests and values in the international standardization organizations.

The DKE is a driver for implementing important political goals through standardization:

- **High-Level Forum:** Wolfgang Niedziella contributes intensively to the forum as president of the European standards committee, CENELEC. One of the committee's goals is to achieve the digital and green transformation of the economy.
- **Strategy forum:** At the end of February 2023, the German Federal Ministry of Economic Affairs and Climate Protection founded the German Strategy Forum for Standardization. Here, strategic standardization topics for Germany are identified and essential impulses for the European High-Level Forum are developed. VDE is contributing two experts from the DKE: Dr.-Ing. Kurt Bettenhausen, DKE President, and Michael Teigeler, DKE Managing Director.
- **Circular economy:** Today's product is tomorrow's raw material. For resources to be effectively protected, materials in particular must be classified and recycling options clearly defined. Norms and standards are essential for this. In order to drive the topic forward, the DKE, together with other partners, published the Circular Economy Standardization Roadmap in mid-January.
- **CRITIS:** Those who want to protect critical infrastructures (CRITIS) also need standards. Current example: In January, the DKE published a preliminary standard for so-called perimeter protection to prevent sabotage at airports or railroad facilities, for example.

CENELEC
Press release on the High-Level Forum

BMWK
Press release on the strategy forum

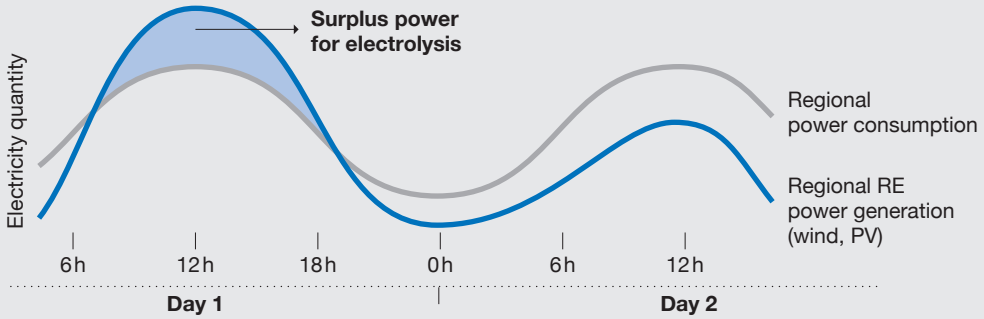
Hydrogen

Using electrolysis flexibly

The German government wants renewable energies to cover 80 percent of the country's electricity needs by 2030. To achieve this goal, innovative storage technologies such as green hydrogen in particular must be expanded. It is important to set the right market incentives within this context.

Flexible hydrogen generation

Electrolysers support the grid when they produce green hydrogen from renewables during phases of elecricity surplus.



Strong winds and sunshine, but hardly any electricity demand? In such instances, it is possible for wind and PV plants to supply more electricity than the grids can absorb. In many cases, this results in shutdowns, and the electricity is irrevocably lost. The second challenge is that renewables are often not installed where they are needed – see large solar parks or offshore wind turbines. This requires a multi-billion-dollar expansion of power lines to industrial centers that takes decades to complete. One approach that promises significant relief would be to store and transport renewable electricity in innovative ways. Flexibly operated electrolysers that produce hydrogen from water using electricity can play a key role here.

Appropriate compensation for flexibility

The German government has recognized the potential of electrolysis. In the coalition agreement, it targets an electrolysis capacity of 10 gigawatts by 2030 – over 150 times more than today. The required expansion will only succeed if policymakers now introduce the right market incentives: electrolysers must also pay off if operators are not seeking full-load operation, but instead specifically incorporate flexibility mechanisms on the market into operation, such as surplus electricity. The EU Commission is right to call for a new regulatory framework to promote this approach. The goal is to use renewables more efficiently with more flexible electrolysers, as well as to better manage the load in the power grids.

Enabling sector coupling

Hydrogen links energy markets with the electricity and gas sectors that were previously largely independent of each other. However, technical terms and interfaces are not uniformly defined – even when it comes to grid-serving flexibility use. VDE provides an important basis for discussion with a discussion paper.

Standardization roadmap leads the way

Norms and standards are essential to the success of the hydrogen market ramp-up. Together with policy makers, authorities, companies and other institutions, the DKE, which is supported by VDE, is making a contribution to this in the BMWK-funded "Hydrogen Technologies Standardization Roadmap" project. Starting in March, experts from all areas of the value chain will identify and close standardization gaps and prepare them for practical application – for the hydrogen market ramp-up and the establishment of a corresponding quality infrastructure.

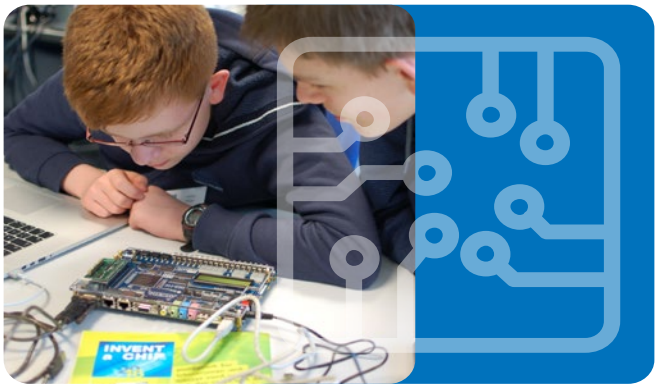
VDE discussion paper
Grid-serving integration of electrolysers

DKE website
Standardization roadmap hydrogren

INVENT a CHIP

Already inspiring tens of thousands of young people

The energy transition, cybersecurity, Industry 4.0: key topics for which Germany will need electrical engineers in the coming years – more so than ever before. VDE is committed like no other organization to getting young people excited about this.



For more than 20 years, VDE has ran the INVENT a CHIP competition in collaboration with the German Federal Ministry of Education and Research. 35,000 young people have already participated. In addition, every year around 15,000 schoolchildren benefit from the teaching materials on microelectronics. The unique selling point of INVENT a CHIP is that it is the only competition in Europe in which schoolchildren are involved in the design of microchips and ultimately build their own circuits.

To reach as many as possible at different levels of knowledge, the competition comprises three elements:

- **Getting started:** microchips are exciting for young people, but not part of school curricula. As an incentive for teachers, VDE has developed a chip quiz together with teaching materials that are thematically in keeping with the Year of Science tag line. The current topic: our universe! The schools can win up to 1,000 euros, and every year more than 120 institutions take part – a figure that is increasing year-on-year.
- **The in-depth content:** in the challenge, students get to grips with chip design. Supported by tutorials, they spend several days designing digital circuits, working with the VHDL hardware language and delving into the binary logic of the chip world.
- **The finale:** the 25 best in the challenge are invited to a four-day camp at the University of Hanover at the end of April. Professionals from the Institute for Microelectronic Systems will support the young people in optimally controlling a so-called solar tracker in the following months. The ten winners will then present their results to experts from business, science and politics at the award ceremony, receive cash prizes, be given the opportunity to complete internships, and get nominated for the German National Academic Foundation.

Microchips move the world; they shape the future. Global sales have quadrupled since 2002 from 141 billion U.S. dollars to 574 billion U.S. dollars in 2022. Business and politics would do well to get young people excited about them.

Schools in your constituency?

Would you like us to target schools in your constituency? Simply send an email to politik@vde.com

Grassroots work at Berlin high school

In mid-January, VDE supported Berlin's Romain Rolland High School on five project days. Experts from VDE Energy, VDE Mobility and VDE Politics were on hand to work with the children on concepts relating to energy supply. Next step: implementing the concepts in the school environement !

Website
INVENT a CHIP competition

Article from the Policy Brief 1/2022
Electrical engineering studies

Website
VDE Study, Career and Society

VDE – the technology organization

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Facts and figures

Founded:	1893
Employees:	worldwide 2,000
Members:	almost 30,000
Volunteer experts:	over 100,000
Locations:	worldwide over 60
Research and funding projects:	175
Events per year:	over 1,600
Product inspections per year:	25,000
Electrical products bearing the VDE certification mark:	billions
Norms and standards:	over 3,500

Legal notice

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