

### **System restructuring continues: Focus on system stability**

**The VDE FNN publishes a roadmap every four years that classifies developments in network and system restructuring from a technical perspective and outlines planned steps. The focus is now on the further development of the regulatory framework, market, and technology, which must work together more closely. "We are currently rebuilding the world's largest machine while it is still in operation – for this to succeed, we urgently need guidance and clarity for all parties involved," says Dr. Joachim Kabs, CEO of VDE FNN.**

**(Frankfurt am Main, January 7, 2026)** The figures are good: according to VDE FNN's 2024 fault and availability statistics, every customer in Germany was supplied with electricity 99.998 percent of the time, with power outages lasting 12.9 minutes per customer. This makes the German electricity system one of the most reliable in the world, with an extensive infrastructure of more than 100,000 km of transmission grid and 1.7 million km of distribution grid reliably supplying 45 million customers with energy. To ensure that this remains the case, grid operators, service providers, politicians, and technical regulators must work together to address the current challenges of grid expansion and digitization that come with the expansion of renewable energies and the electrification of heating and mobility.

Since 2017, the Network Technology and Operation Forum within VDE (VDE FNN) has been publishing its roadmap on this topic, using three key areas of action to show what the status quo looks like from a technical perspective and where concrete work is being done. The VDE FNN Roadmap 2025 "From Grid to System" builds on the previous roadmaps. "At the moment, more and more challenges are arising in practice. In this environment, it is our aim as VDE FNN to act with foresight, provide guidance, and ensure continuity," says Dr. Joachim Kabs. It is important to understand that the ongoing transformation is making an important contribution to both climate protection and reducing dependence on imports for energy supply.

### **System conversion during ongoing operation: focus on secure supply**

To ensure system stability, all renewable energy storage and generation facilities must gradually replace the existing large power plants in terms of their function – not only in terms of output, but also in terms of technical capabilities and services for the system. Since 2023, the System Stability Roadmap of the Federal Ministry for Economic Affairs and Energy (BMWE) has defined the goal of a stable electricity system even with 100 percent generation from renewable energies. The aim is to meet systemic demand through minimum technical requirements, market-based procurement, and integrated grid components. VDE FNN develops the requirements for system-supporting and grid-forming properties of customer installations and incorporates these into the BMWE roadmap.

Another key aspect is the further development of the grid connection rules (TAR), which define the requirements for grid operators and grid customers at the grid connection point. This involves new requirements for generation plants, the connection of storage facilities and heat pumps, the definition of system-supporting behavior, and the prerequisites for control at the grid connection point. "One element of the regulatory framework that we urgently need is the revised European Connection Network Codes (CNC 2.0). The EU Commission has currently deprioritized these without setting a new deadline. This means that an important building block for the further development of a stable, harmonized electricity supply based on renewables in Europe is missing," says Heike Kerber, Managing Director of VDE FNN. This is particularly true given that the Network Code Demand Response also indirectly delays the establishment of important processes and market rules for customer participation in Europe. To bridge the regulatory gap, VDE FNN is currently examining how the requirements of the planned CNC 2.0 can be adapted to national circumstances.

### **Digitalization as a driver: Involving end customers in the energy transition**

The central element of digitalization in the distribution network is the intelligent metering system (iMSys), a combination of modern metering equipment and a smart meter gateway. The iMSys control device enables the control of flexible systems in the low-voltage grid, which, according to the German government's plans, will affect at least 23 million end customers. This allows them to fully leverage the potential of the flexibility provided and dynamic electricity tariffs. The use of flexible solutions and the ability to intervene in the event of bottlenecks are key components of grid and system operation for ensuring security of supply.

VDE FNN considers the use of smart metering systems to be an end-to-end process. Heike Kerber: "We not only describe technical components, but also provide implementation assistance for all parties involved, from electronic delivery notes to the execution of control commands. "In order to gain momentum in terms of control, it is necessary for the diverse regulations in the regulatory framework to focus more strongly on grid connection instead of –

as has been the case up to now – on individual plant types and on generation and consumption separately. Control in accordance with Section 14a EnWG and Section 9 EEG must be considered in an integrated manner in terms of technology and processes. Cybersecurity is an indispensable requirement here, which must be designed from the backend to the smart metering system. Private customer systems are becoming system-critical on a large scale and must be taken into account in order to protect the system from attacks.

### **Grid operation of the future: security and efficiency**

The third focus of the VDE FNN Roadmap lays the foundations for secure and efficient grid operation. The transformation of the energy system is leading to more volatile behavior among market participants, especially in distribution grids. Employees in the grid control centers must be able to monitor the current grid situation to be able to respond appropriately to threats or disruptions in accordance with Sections 13 and 14 of the German Energy Industry Act (EnWG).

A common understanding of resilience and the measures to be taken will adapt the basis for a more robust and secure energy system to the new challenges. Legal frameworks such as the KRITIS (critical infrastructures) umbrella law must be considered. Continuous review and further development of primary and secondary technology as well as crisis and risk management systems make a significant contribution to the resilience of our electricity supply system.

VDE FNN also supports these areas by further developing processes, recommending courses of action, and describing technical requirements. "Our roadmap sets out what we want to do – and then we do it," says Dr. Joachim Kabs. "We provide guidance from a technical perspective, thereby contributing to the targeted further development of technology, the market, and the regulatory framework. Ensuring a reliable energy supply based on renewable energies must remain our common goal."

### **About VDE FNN:**

The Network Technology and Operation Forum within VDE (VDE FNN) develops the electricity grids with foresight. The aim is to ensure reliable system operation at all times with 100 percent renewable energies. VDE FNN makes innovative technologies practicable and provides answers to the grid technology challenges of tomorrow. Here, various specialist groups with different interests work together on solutions. Its members are over 500 manufacturers, grid operators, suppliers, system operators, authorities, and scientific institutions.

For more information, visit [www.vde.com/fnn](http://www.vde.com/fnn)

**About VDE:**

VDE, one of the largest technology organizations in Europe, has been regarded as a synonym for innovation and technological progress for more than 130 years. VDE is the only organization in the world that combines science, standardization, testing, certification, and application consulting under one umbrella. The VDE mark has been synonymous with the highest safety standards and consumer protection for more than 100 years.

Our passion is the advancement of technology, the next generation of engineers and technologists, and lifelong learning and career development “on the job”. Within the VDE network more than 2,000 employees at over 60 locations worldwide, more than 100,000 honorary experts, and around 1,500 companies are dedicated to ensuring a future worth living: networked, digital, electrical.

Shaping the e-dialistic future.

The VDE (VDE Association for Electrical, Electronic & Information Technologies) is headquartered in Frankfurt am Main. For more information, visit [www.vde.com](http://www.vde.com)

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