



Solutions for the Future Power Grid

We are evolving the grid

VDE Association

The VDE Association for Electrical, Electronic and Information Technologies is one of the largest technical and scientific associations in Europe. VDE embraces science, standardization work and product testing and certification under one roof. VDE is involved in technical knowledge transfers, research, and promoting young talents.

Over **36,000** members
from research and industry

1,600 employees in over **60** countries

VDE|FNN: grid experts in the VDE

Forum Network Technology/Network Operation is the part of the VDE driving technical regulation for the power grid in Germany.

What do we do?

VDE|FNN works in close cooperation with stakeholders to establish system requirements which support the development of the grid towards 80% renewables by 2050 (aim of the German Energy Policy).

Founded in 2008

Over **450** members from
businesses and organisations

Network operators following VDE application rules are compliant with the German Energy Law (EnWG §49)

VDE|FNN is powered by more than **500** voluntary experts:

- Network operators
 - Metering point operators
 - Plant operators
 - Research institutes
 - Manufacturers
 - Public authorities
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What are our goals?

Higher security of investment

Develop forward-looking specifications to improve security of investments for product developers, manufacturers, network customers and network operators.

Faster application and compatibility of grid technology

Accelerate the implementation of innovations in grid technology for everyday operation and ensure support for system needs.

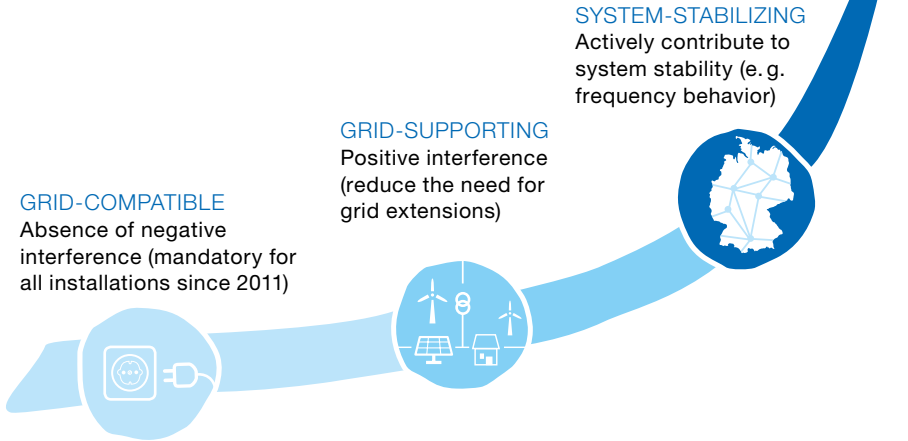


Achieve a reliable system operation with an increasing penetration of renewable energy systems and new grid users

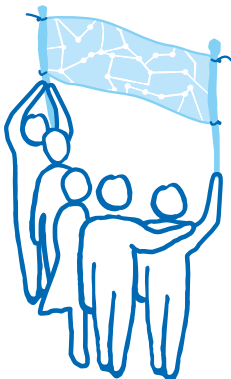
Evolving the grid for the energy transition

Today's generators impact the system for over 20 years: forward-looking rules are essential for the evolution of grid-connected systems

On the path to **80%** renewables in 2050



How do we drive the energy transition forward?

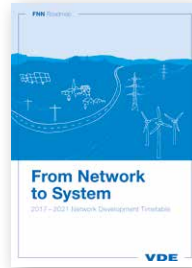


- Develop VDE application rules for network operation and technology
- Represent best interest for the system by developing forward-looking requirements
- Advise authorities and regulators on grid development policies
- Bring stakeholders together to work towards a safe and reliable grid
- Collaborate with regulators and research institutions worldwide
- Implement European Network Codes in Germany and assist in the development of international network codes

FNN Roadmap – From Network to System

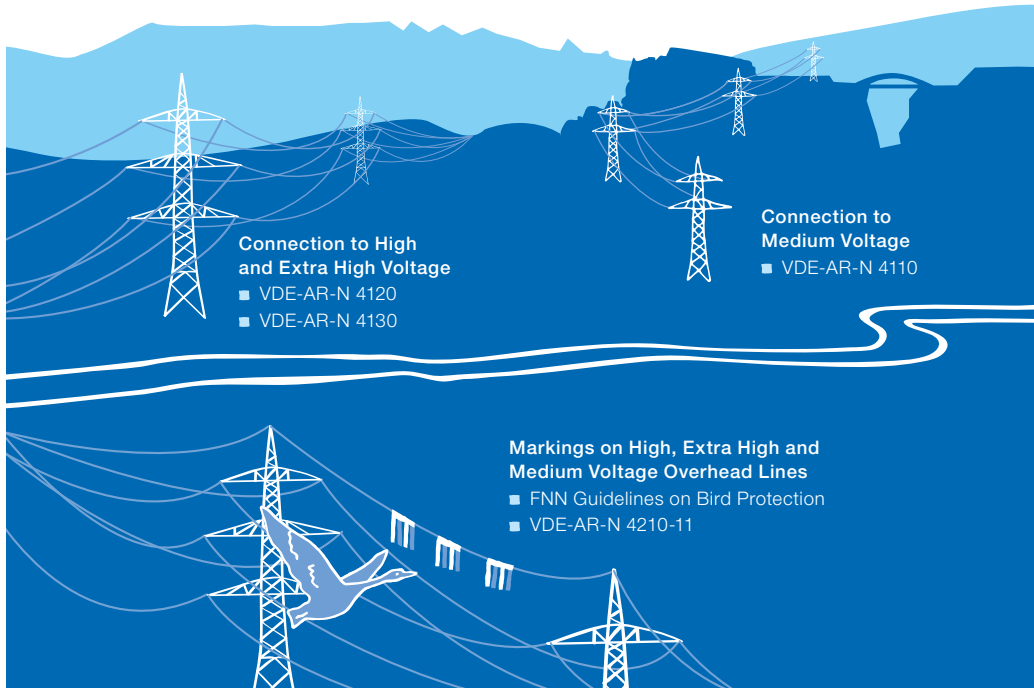
What are the upcoming challenges?

- New grid users and more combinations of consumers, generators and energy storage
- Decentralized systems gaining importance in system operation
- Need for standards in ICT and innovative grid technology
- Technology to support efficient and transparent market mechanisms



- Roles and tasks
- Network and system operation
- Communication technology

Find our Roadmap 2017–2021 at:
www.vde.com/en/fnn/topics/fnn-roadmap



Our Network

Grid Operation and Technology

- Innovative Grid Operation
- Power Quality
- Environmental Protection
- Operational Safety

Metering and Digitalization

- Intelligent Metering Systems
- Data Security
- Grid-supporting Controllability
- ICT

System Security and Grid Codes

- Flexibility for Distribution Networks
- Grid Connections
- European Network Codes
- Grid Planning
- System Needs and Responsibilities

Supporting the Energy Transition

- Technical Regulation in Germany
- FNN Roadmap
- Grid is the Backbone for E-mobility

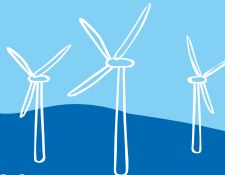


Connection to Low Voltage

- VDE-AR-N 4100

Grid Connection of HVDC Systems and Power Generation Systems connected via HVDC Systems

- VDE-AR-N 4131



Underground Powerline Construction

- VDE-AR-N 4220



Power Generation Systems Connected to Low Voltage

- VDE-AR-N 4105

Documentation Specifications for Laying Protective Tubes and Cables





- VDE-AR-N 4222

Extract from VDE|FNN publications

VDE|FNN as your international partner

VDE|FNN in collaboration with VDE Renewables:
expertise for projects worldwide

VDE FNN
VDE RENEWABLES

<p>Application of grid codes and best practice in Germany</p>  <p>For:</p> <ul style="list-style-type: none">■ Plant operators■ Manufacturers	<p>Advice on development of grid codes</p>  <ul style="list-style-type: none">■ Public authorities■ Energy regulators■ Network operators	<p>Training concepts and workshops (metering, inverters, etc.)</p>  <ul style="list-style-type: none">■ Public authorities■ Network operators	<p>Compliance with international standards for grid connection</p>  <ul style="list-style-type: none">■ Renewable project developers■ Manufacturers
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What is our experience internationally?

- Implementation of European Network Codes in Germany
- Research collaborations
- Grid studies for future grid requirements
- Innovative grid technologies e. g. regulated local grid transformers, new concepts for power quality monitoring, dynamic weather-dependent line operation
- Accredited R&D facilities and laboratories for PV and energy storage through **VDE Renewables**

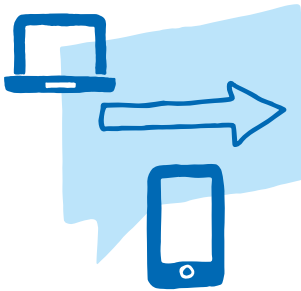
The VDE|FNN in a nutshell

- Common partner for industry, research and authorities in Germany and internationally
- Transferrable solutions for the power grid
- Up-to-date technical guidelines and positions

VDE|FNN, grid-focused and hands-on

Join us, it is worth it!

- Interact directly with experts from other interest groups and specialist circles
- Gain access to early information on new developments
- Elect VDE|FNN's committee
- Enjoy discounts for events and publications
- Access online resources



It's simple!

Register online at:
www.vde.com/fnn-beitritt

Visit us at:
www.vde.com/en/fnn

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