

# Wind power plants Grid compatibility with certificate

More and more wind power plants are being connected to the grid. This requires confirmation of grid compatibility. What are the requirements for the certificate?

Plant and type-specific certificates that set out the electrical characteristics of the generating unit (wind turbine) and the generating installation (wind farm) are required before wind power plants can be connected to the German power grid. Basic requirements are reviewed such as short-circuit strength, continuous current-carrying capacity, active and reactive power provision and the regulation thereof. In addition, the electric generator's behaviour in the event of a network failure – for example, a voltage drop – has to be reasonable.

New plants must play an active role in maintaining the stability of the voltage and frequency of the grid. This applies to medium-voltage and high-voltage grids and also to the supergrid. Certification is effected on the basis of the Ordinance on System Services by Wind Energy Plants (SDLWindV). The BDEW Guideline (German Federal Association of Energy and Water Management) is also relevant for connection to the medium-voltage grid, while the so-called TransmissionCode 2007 (network and system rules of the German transmission system operators) is relevant for connection to the high-voltage grid and the supergrid.

The central documents on grid integration are the so-called EZE or EZA certificate and the EZA reports. They are also required if the operator wants to receive feed-in reimbursement in accordance with the German Renewable Energy Sources Act (EEG). This also

applies to the system service bonus in accordance with SDLWindV. This Ordinance regulates in particular the requirements on production management and the behaviour of a wind power plant in the event of network failures. A bonus of 0.5 cents per kilowatt hour is possible if the requirements are met.

## The unit certificate

The unit certificate certifies in accordance with SDLWindV that a wind power plant meets the EEG provisions pertaining to grid connection characteristics. A unit certificate can only be issued on compliance with all technical requirements from the relevant guidelines. The FGW Technical Guidelines Part 8 form the basis for testing. This requires simulation of the electrical characteristics of generating units (EZE) and plants (EZA) using computer-aided models. These are also validated on the basis of the guidelines.

As the first step towards possible certification the TÜV SÜD experts review the submitted certification documents for completeness and plausibility. The electrical characteristics are then evaluated in accordance with the technical requirements, such as active power output, reactive power provision or circuit feedback. The results are summarised in a report. The EZE model is then validated for network calculations using special software. This includes stages such as the creation of a validation plan and static load flow calcula-



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tions and failure simulations. The results are recorded and evaluated in a model validation report. These results are then combined with those from the conformity testing in a detailed report, which concludes with a recommendation for or against certification.

## The plant certificate

A so-called plant certificate has to be created based on the unit certificates and taking the existing electrotechnical components of the wind farm into account. This is also effected in stages. This not only requires certificates on the specific generating units, but also models validated as executable. The process here also begins with a review of the submitted documents – included in the planning. Are these complete and plausible?

This relates especially to:

- Data surveys (wind farm operator/distribution system operator)
- The project-specific unit certificate and calculation model
- An overview of the wind farm (single line diagram)
- The connection diagrams for the medium-voltage plants
- The protection concept ("decoupling protection")
- Overview of the wind farm control
- The regulatory concept for reactive and active power provision
- Certificates and conformity declarations for operating resources
- Technical data on cabling, transformers and operating resources (switchboard plants, controller or the dynamic reactive power compensation)

The requirements stipulated by the technical guidelines and the distribution system operator are then coordinated in detail with the applicant and the manufacturers of the generating units and the components. This is followed by the calculations required by FGW Technical Guideline Part 8. A plant model is also created here for the wind farm. The model also includes the wind farm's operating resources and the main power supply at the grid's point of common coupling. This facilitates simulation of the static and dynamic behaviour in accordance with FGW and BDEW guidelines.

A conformity report is created based on detailed calculations and reviews, which

summarises the technical characteristics of the generating plant. After installation of the wind farm, each plant must be appraised once again to ensure that the plant certificate and conformity declaration concur. To do this, the engineers reappraise the circuit documents, commissioning documents and protection test logs, as well as the plant on site. The basic regulatory functions are randomly tested in cooperation with the network operator.

## Conclusion and recommendation

Certification of a wind power plant's grid compatibility is an extensive and highly complex process. The reason for this is the array of different guidelines and re-

quirements. If the generating unit or plant conforms to the technical guidelines, then a unit or plant certificate is issued.

TÜV SÜD experts recommend detailed surveys and designs to clarify grid compatibility early on. To achieve this the manufacturers of the wind power plants have to cooperate closely with appointed third-party firms and the accredited test lab. It is important that the details in the surveys are consistent to ensure reliable compliance with all deadlines. Practical experience shows: a well-documented and easy-to-use simulation model for the behaviour of the wind power plant in the electrical grid substantially accelerates the testing and certification process.

## About TÜV SÜD Industrie Service

TÜV SÜD Industrie Service GmbH is part of TÜV SÜD AG and offers engineering, testing and consulting services for manufacturers and operators of plants, buildings and infrastructure facilities. The around 2,400 employees also consult on planning and construction and support their clients on optimising and safeguarding trouble-free operation, as well as decommissioning and waste disposal.

For manufacturers and operators of wind power plants TÜV SÜD offers site evaluations, project and type certification both on and offshore in Germany and abroad. The range of services was recently expanded with certification of grid compatibility for power generation units and plants. DAkkS (German Accreditation Body)

has authorised TÜV SÜD as a certification body for grid compatibility to test power generating plants and units. The international service provider has also been recommended as a certification body by the Federation of German Windpower and other Renewable Energies (FGW).

The TÜV SÜD teams of experts have many years' experience and interdisciplinary engineering know-how and an outstanding knowledge of all relevant guidelines and standards. The high standard of the economic and ecological realisation of projects, neutrality and objectivity are the reason for the top-class international reputation, recognition and acceptance of TÜV SÜD expertise.

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