

The EMC Directive and its Applicability to Wind Turbines

The requirements of fixed installations place special requirements on manufacturers, project developers
and operators of wind turbines

Holger Berndt

Germanischer Lloyd Industrial Services GmbH, Renewables Certification (GL)

Brooktorkai 18, 20457 Hamburg

Tel.: +49 (0) 40 - 3 61 49 - 52 56, Fax: +49 (0) 40 - 3 61 49 - 17 20

E-mail: Holger.Berndt@gl-group.com

On December 15, 2004, the Directive 2004/108/EC [3] on electromagnetic compatibility was published by the European Commission. As of July 20, 2009, it has bindingly replaced the old EMC Directive 89/336/EEC [2] that was previously applicable, and since then is frequently found in CE declarations of conformity for wind turbines. Rightly so? This question as well as the requirements connected with the new EMC Directive are setting manufacturers and operators of wind turbines new challenges as shown in the article presented here.

Article 1 of the applicable EMC Directive sets out its objective and scope. It states: "This Directive regulates the electromagnetic compatibility of equipment. It aims to ensure the functioning of the internal market by requiring equipment to comply with an adequate level of electromagnetic compatibility. This Directive applies to equipment as defined in Article 2." In this regard, Article 2 continues:

"For the purposes of this Directive, the following definitions shall apply:

- a) "equipment" means any apparatus or fixed installation;
- b) "apparatus" means any finished appliance or combination thereof made commercially available as a single functional unit, intended for the end user and liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance;
- c) "fixed installation" means a particular combination of several types of apparatus and, where applicable, other devices, which are assembled, installed and intended to be used permanently at a predefined location".

Accordingly, the term "equipment" is a generic term for apparatus and fixed installations, and all apparatus and fixed installations that can cause electromagnetic disturbance or for which the operation can be adversely affected by this disturbance fall within the scope of application of the EMC Directive. Hence, all electrical and electronic apparatus, installations and systems are affected that contain electric and/or electronic components.

One section of the provisions of the directive applies to apparatus and fixed installations together, for example the general protection requirements and the principle according to which these protection requirements can be specified in harmonised standards whose application is facultative. The directive, however, makes a clear distinction between apparatus and fixed installations with regard to documentation of compliance with the protection requirements. For example, for all apparatus that will be placed anywhere on the Single European Market and which can be put into operation, it requires compliance with a stipulated conformity assessment

procedure as well as the CE marking. However, this procedure does not seem to be suitable for fixed installations.

The term "fixed installation", in the view of the European Commission, is a comprehensive term for electrical installations consisting of different types of apparatus and other devices that are combined permanently at an unchangeable location. The smallest electrical systems as well as large scale energy and telephone networks for commercial and industrial applications fall under this term. However, "large machines" can also be fixed installations.

A formal conformity assessment of such installations is often difficult to perform and in some cases even impossible due to their size and complexity. In addition, fixed installations are often subject to constant change through which the formal conformity assessment of their undefined and changeable EMC conditions also appears to be problematic.

For these reasons, the EMC Directive foregoes a formal conformity assessment and CE marking of fixed installations. However, it stipulates that such installations must be installed according to generally accepted rules of technology, and that the specifications for the intended use of the installed components must be observed. The measures for compliance with the essential requirements of the EMC Directive must be documented. Furthermore, an accountable person must be appointed to hold the appropriate documents at the disposal of the relevant national authorities for inspection purposes for as long as the fixed installation is in operation.

So, how is the EMC Directive to be applied to wind turbines? A wind turbine is transported to its site of installation in separate parts and assembled on-site, erected and put into operation. It is operated exclusively at that location. According to these requirements, a wind turbine is a fixed installation according to the definition of terms in the EMC Directive. In addition, the European Commission gives a non-exhaustive list in its guide for the EMC Directive [4] with examples of fixed installations in which the term "Wind Turbine Stations" can be found, which is translated by the German Federal Network Agency as "Windenergieanlagen" respectively "wind turbines" [1].

Because of this definition, there will presumably be a considerable need for mutual consultation in future among manufacturers, project developers, and operators of wind turbines and wind farms. The EMC Directive specifies that information must be contained in the documentation of wind turbines and wind farms for which measures have been taken to ensure compliance with the EMC protection goals. In this case, the system manufacturer, project developer and wind farm operator are assigned an active role in keeping the EMC documentation for their wind turbines and wind farms up-to-date and thereby provide evidence of compliance with recognised engineering rules. This starts with planning and continues through to assembly and commissioning by the different construction companies that are involved. During operation of the wind turbines, service, maintenance, repairs or modifications that have effects on the electromagnetic compatibility must also be documented.

EMC documentation that conforms to the directive includes the following in particular:

- the assembly, operating and maintenance manuals of the installed devices such as the generators, rectifiers, electrical cabinets,
- the design considerations of the wind turbine that relate to EMC and a description of the solutions for compliance with the EMC protection requirements,
- information on shielding, cable shielding, cable routing,
- measurement reports, if any exist,
- as well as references to applied standards or parts of standards.

Even if the EMC Directive does not stipulate a formal assessment, it is still recommended that EMC measurements be performed based on relevant EMC standards if they are applicable. In addition, the basic standard for the design of wind turbines, EN 61400-1:2005 [6], obligates manufacturers to EMC assessment and to the respective measurements. At the same time, it refers to relevant EMC standards such as, for example, the harmonised generic standards EN 61000-6-1 and 61000-6-2, in which application to wind turbines is not possible without restrictions and therefore has to be discussed with experienced experts.

The EMC Directive requires the appointment of a person who is responsible for establishing the conformity of a fixed installation with the relevant, underlying requirements of the EMC Directive. This means that there must be an EMC contact person available for each installed wind turbine and each wind farm. In Germany, the EMC Directive has been enacted in national law by the EMC Act (EMVG) [5]. According to the EMVG, the operator is responsible for compliance with the basic requirements and maintenance of the latest documentation. The EMVG defines a fine of up to €50,000 for regulatory offenses.

The requirements for EMC responsibility mean that wind farm operators in particular are faced with a new responsibility. Since wind farm operators usually have limited EMC expertise, they will obtain the respective expertise from the wind turbine manufacturer, the wind farm project developer, the maintenance company and from other involved parties who work on wind turbines over the course of the lifecycle. However, due to the complexity of the topic, it is difficult for many companies to maintain the corresponding expertise. Special knowledge is necessary for experts who come into question for this, both regarding relevant EMC standards as well as their applicability to the great variety of systems and configurations. Independent experts in particular offer manufacturers, project developers and operators of wind turbines and wind farms extensive assistance in EMC assessment and compliance. Therefore, professional and successful management of the EMC Directive is not a matter of chance!

[1] German Federal Network Agency (2007): Guideline for application of the 2004/108/EC directive of the Council from December 15, 2004 for harmonisation of the legal regulations of member countries for electromagnetic compatibility.

[2] European Parliament/European Council (1989): Directive 89/106/EEC of the Council for harmonisation of the legal regulations of member countries for electromagnetic compatibility from May 3, 1989. Official Gazette of the European Community No. L 139 from May 23, 1989.

[3] European Parliament/European Council (2004): Directive 2004/336/EEC of the European Parliament and the Council from December 15, 1998 for harmonisation of the legal regulations of member countries for electromagnetic compatibility and for termination of Directive 89/336/EEC. Official gazette of the European Community No. L 390/24 from December 31, 2004.

[4] European Commission (2007): Guide for the EMC Directive 2004/108/EC.

[5] Act for the electromagnetic compatibility of resources (EMVG) from February 26, 2008 (BGBl I. Pg. 220), last changed by Article 3 of the Act from July 29, 2009 (BGBl. I Pg. 2409).

[6] EN 61400-1 (2005): Wind Turbines - Part 1: Design requirements.

For further information:

Author: Holger Berndt

Address: Germanischer Lloyd Industrial Services GmbH, Renewables Certification (GL)
Brooktorkai 18
20457 Hamburg

Tel.: +49 (0) 40 - 3 61 49 – 52 56
Fax: +49 (0) 40 - 3 61 49 - 17 20
Email: Holger.Berndt@gl-group.com
Internet: www.gl-group.com/GLRenewables