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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This Technical Report was prepared by the Technical Committee CENELEC TC 88 (former CLC/BTTF 83-2), Wind turbine systems.

The text of the draft was submitted to the formal vote and was approved by CENELEC as CLC/TR 50373 on 2004-03-16.

Contents

Introduction

This Technical Report is intended to provide guidance, to manufacturers, vendors, purchasers and users of wind turbines, on the application of Electromagnetic Compatibility (EMC) standards. The extent to which EMC phenomena are covered is indicated in the scope of this Technical Report.

Manufacturers and vendors of wind turbines should refer also to Article 10 of the Council Directive 89/336/EEC of 3 May 1989 (the Electromagnetic Compatibility (EMC) Directive), which covers such matters as declarations of conformity and CE marks.

1 Scope

This Technical Report provides guidance on requirements for the electromagnetic compatibility of wind turbines of all sizes, to assist with achieving compliance with EMC standards. This Technical Report includes guidance on emissions, and for immunity to external disturbances.

Safety related aspects are not included in this Technical Report. They are the subject of relevant parts of EN 61400.

This Technical Report is applicable to electromagnetic emissions and immunity, both conducted and radiated, in the range 0 Hz to 400 GHz (although generally EMC standards do not at present contain test methods or limits at frequencies above 1 GHz). Fault conditions are not taken into account.

This Technical Report does not include test procedures, conditions, limits, or reference values; these requirements are included in relevant parts of EN 61000, which are referred to in this Technical Report where necessary.

This Technical Report also provides guidance for wind turbine installations (wind farms or single machines).

The electromagnetic compatibility of components within the wind turbine (i.e. within enclosed parts of the wind turbine, which may include the hub, nacelle and tubular tower) with each other is solely a matter for the wind turbine manufacturer.

The physical impact of the structure on the reception of radio services in the vicinity needs to be considered as a separate issue, and is not dealt with in this Technical Report. It should be noted that although experience to date has shown that physical interference to broadcasting services has caused the majority of complaints, wind turbines are capable of interfering with all radio services to some extent.

2 References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 55011 Industrial, scientific and medical (ISM) radio-frequency equipment - Radiodisturbance characteristics - Limits and methods of measurement (CISPR 11)

EN 61000-5 Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines (IEC 61000-5)

EN 61000-6-1 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1, mod)

EN 61000-6-2 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2, mod)

EN 61000-6-3 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3, mod)

EN 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments (IEC 61000-6-4, mod)

EN 61400-21 Wind turbine generator systems - Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines (IEC 61400-21)

3 Definitions

Definitions related to EMC and to relevant phenomena may be found in the EMC Directive, in Chapter 161 of the IEV (IEC 60050) and in CISPR publications. The definitions stated in the EMC Directive take precedence.

For the purposes of this Technical Report, the following definitions apply:

3.1
low voltage (LV)
in this document, LV refers to $U_n \leq 1$ kV

3.2
medium voltage (MV)
in this document, MV refers to 1 kV < $U_n \leq 35$ kV

3.3
high voltage (HV)
in this document, HV refers to $U_n > 35$ kV

3.4
port
particular interface of the specified apparatus with the external electromagnetic environment
[EN 61000-6-3]

NOTE Definitions of particular types of port are provided in EN 61000 series.

3.5
wind turbine, wind turbine generator system (WTGS)
a system which converts kinetic energy in the wind into electrical energy
[IEC 61400-1]

4 Symbols and abbreviations

EMC Electromagnetic Compatibility

U_n Phase to phase nominal voltage (V)

5 Guidance for wind turbines

5.1 General

To enable presumption of compliance with EMC standards, a wind turbine, being a single unit for commercial trade (a “finished product” in the terms of the Directive and Guidelines), should meet a particular set of requirements.

The generic EMC standards EN 61000-6-1 to EN 61000-6-4 define two alternative environments in which electromagnetic compatibility is considered.

The locations wind turbines may operate in do not closely match the terms used by the generic standards, and it is not possible to relate all wind turbines to one and only one of these environments. Therefore the manufacturer should specify in the instructions for use, on product literature, and on the wind turbine nameplate, which of the following environments the wind turbine is intended for

– industrial (i.e. EN 61000-6-2 and EN 61000-6-4 apply),

– or residential, commercial and light industry (i.e. EN 61000-6-1 and EN 61000-6-3 apply),

– or the most onerous (i.e. EN 61000-6-2 and EN 61000-6-3 apply).

The choice made by the wind turbine manufacturer should be applied consistently in 5.2, 5.3 and 5.4.

The industrial environment is suitable if the manufacturer intends the wind turbine to be

– connected to a high-voltage or medium-voltage power network, probably by means of a transformer,

– or located in or close to industrial locations (as defined in EN 61000-6-4).

The residential, commercial and light industrial environment is suitable if the manufacturer intends the wind turbine to be

– connected to a local public mains network (distribution grid) at low voltage,

– or located close to residential, commercial or light industry premises.

Independent of the requirements dictated by the environment, sound EMC engineering will be important. Engineering and construction should be realised according to relevant parts of EN 61000-5.

Note that cables and cable accessories are considered to be electromagnetically passive items and are excluded from the scope of harmonised EMC standards. However, the manufacturer’s instructions for use which accompany other items may place requirements on the cables used to interconnect those items.

5.2 Emissions

All wind turbines will contain an “enclosure port”. Other types of ports may not be present in all cases.

5.2.1 Enclosure port

The requirements of EN 61000-6-3 or EN 61000-6-4 for the enclosure port are relevant.

The requirements may be assumed to be satisfied if all the electrical and electronic apparatus within the wind turbine:

– conform to the relevant EMC product or generic standard for the relevant electromagnetic environment (i.e. are themselves CE-marked) or are exempt or excluded from the scope of the Directive,

– and are installed in accordance with the instructions and limitations of use provided by their manufacturers.

5.2.2 AC power port

This subclause applies only to wind turbines intended for direct connection of the AC power port to a public low voltage electricity system, i.e. without an external power transformer. For other cases, see Clause 7.

The requirements of EN 61000-6-3 or EN 61000-6-4 for emissions through the AC power port in the range 0 kHz to 2 kHz can be replaced by the requirements of EN 61400-21. This standard for power quality of wind turbines does not set limits for emissions. However it does provide methods to characterise power quality of wind turbines, and to calculate from those characteristics the conducted emissions which will be experienced in a particular location. These emissions can then be compared against electricity utility requirements for the intended locations or markets.

The requirements of EN 61000-6-3 or EN 61000-6-4 for emissions through the AC power port for frequencies above 2 kHz can be assumed to be satisfied if all the electrical and electronic apparatus within the wind turbine, through which the power produced by the wind turbine flows,

– conform to the relevant EMC product or generic standard for the relevant electromagnetic environment (i.e. are themselves CE-marked) or are exempt or excluded from the scope of the Directive,

– and are installed in accordance with the instructions and limitations of use provided by their manufacturers.

5.2.3 DC power port

The requirements of EN 61000-6-3 or EN 61000-6-4 for DC power ports are relevant.

The requirements can be assumed to be satisfied if all the electrical and electronic apparatus within the wind turbine, through which the DC power produced by the wind turbine flows,

– conform to the relevant EMC product or generic standard for the relevant electromagnetic environment (i.e. are themselves CE-marked) or are exempt or excluded from the scope of the Directive,

– and are installed in accordance with the instructions and limitations of use provided by their manufacturers.

5.2.4 Signal and control ports

The ‘signal and control ports’ of a WTGS typically consist of connections to remote computers and communication equipment, via a public telephone system or a dedicated communications system.

The requirements of EN 61000-6-3 or EN 61000-6-4 for signal and control ports are relevant.

These requirements shall be assumed to be satisfied if all the constituent parts of the signal and control apparatus within the wind turbine:

– conform to the relevant EMC product or generic standard for the relevant electromagnetic environment (i.e. are themselves CE-marked) or are exempt or excluded from the scope of the Directive,