

GE Energy

Technical Documentation Wind Turbine Generator Systems GE - All Turbine Types



Machine Noise Performance Test

MNPT



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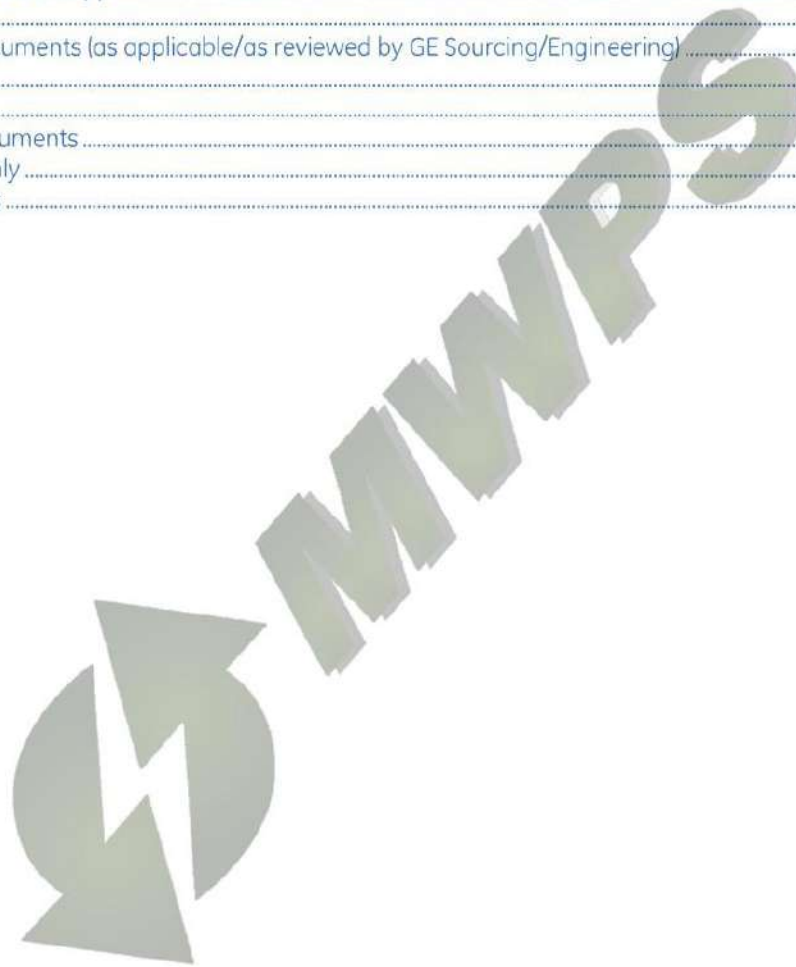
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1 Definitions

- "Supplier" shall mean the supplier hired by the "Buyer" to perform the test
- "Buyer" shall mean the Turbine owner, GE Energy's contractual partner
- "Seller" shall mean GE Energy as turbine manufacturer
- "MEASNET" shall mean "Measuring Network of Wind Energy Institutes"
- "MNPT" shall mean "Machine Noise Performance Testing", this document

2 Preliminary Remarks

It is intended that this specification for machine noise performance test (MNPT) establishes the design and operating conditions and indicates the general construction and special features of the desired equipment, which is complete and operable when installed and operated in accordance with GE's and the Supplier's recommendations. Incidental items which are essential for complete and operable units, but which may not be specifically described herein, shall be included.

Quality, reliability, availability, maintainability, and delivery are of the utmost importance to GE Energy in the design of the equipment described herein.

3 Important Notice to Supplier

It is imperative that the Supplier carefully reads and understands this entire document. Any questions, exceptions, deviations the Supplier may have with this specification and/or any other supporting GE Energy documentation must be brought to the attention of the responsible GE Energy contact within GE Energy as early as possible.

4 Scope

The machine noise performance test may be conducted at any time throughout the warranty period, subject to the conditions specified herein. If measured results from a properly conducted test fall within the warranted parameters, the unit(s) will be considered in compliance, and the noise guarantee has been satisfied. The customer will have no further claims on GE regarding noise.

In the event of doubt in the compliance with the warranted noise level, the Buyer shall be entitled to have it measured by a qualified test laboratory with all required in accordance with the above Guideline and at the Buyers expense. Where it is proven, that the warranted noise level is exceeded in accordance with the conditions set forth in this document (excluding contribution from sources outside sellers scope), GE Wind shall be bound and entitled to rectify it, based on the conditions contained herein, and as specified in the Terms and Conditions of the contract.

5 Applicable Documents (as applicable/as reviewed by GE Sourcing/Engineering)

The measurement, data processing and evaluation of the wind turbine's noise emission parameters are to be performed by an accredited and qualified measurement institute. The measurement institute has to show their experience in noise measurements at wind turbines according to the valid standards. Accreditation can be proven e.g. by compliance with the regulations of EN/ISO/IEC 17025, or in Germany with §26/28 BImSchG, or by membership in MEASNET.

The procedure ("Test Procedure") set forth in the publications:

- *Germany*
FGW-Guideline Part 1, most current valid revision, at least rev. 17, Determination of sound emission values, Fördergesellschaft Windenergie e.V.
- *Germany and all other*
IEC 61400-11, most current valid edition, at least ed. 2.1, 2006-11, Wind Turbine Generator Systems - Part 11: Acoustic Noise Measurement Techniques

shall govern the Tests, with the following deviations or additions (sections of IEC 61400-11 ed.2.1):

Section 6 Instrumentation

- Secondary windscreen is mandatory. It has to be assured that the influence of the secondary windscreen on the frequency response must be documented and corrected for.

Section 7 Measurements

- The averaging time can be shorter than 1 minute, but not less than 10 s (7.2.2.1).
- For the turbine noise at least 90 minutes in total should be measured and for background noise at least 30 minutes in total shall be measured, covering corresponding ranges of wind speed as described in the IEC (5. and 7.2.2.1). A wind speed bin (1 m/s width) is only valid when it contains at least 5 minutes of data.
- Only Method 1 (7.3.1.1 Determination of wind speed from the electric power output and the power curve) shall be used.
- The nacelle anemometer method (7.3.1.1.1) shall be used.
- Wind direction can be measured with the yaw position of the affected turbine.

Section 8 Data reduction procedures

- For tonality analysis the frequency resolution shall be $2\text{Hz} \pm 1\text{Hz}$ for the entire bandwidth.

Annex C Assessment of Turbulence intensity

- The turbulence measurement shall be mandatory

The Buyer may choose to undertake Tests on any Turbine location that complies with the limits of the Test Procedure, e.g. in terms of sufficient signal-to-noise ratio.

The Parties recognize that conformance with the Test Procedure may require that some Turbines be turned off during certain Tests. Any hours during which Turbines are turned off for purposes of the Tests shall not be counted against Availability Guarantee.

All testing must be conducted with equipment (measurement and turbine equipment) in a "new and clean" condition. It is the Buyer's responsibility to ensure that the equipment is inspected and any required maintenance is performed prior to the test, including correcting mechanical defects, unusual wear and blade fouling by insects or other airborne materials.

5.1 Reporting

The Buyer shall report all relevant data and information stated in the Test procedure IEC 61400-11: Section 9: Information to be reported as a minimum.

The Buyer shall issue to Seller a copy of the complete test report upon completion.

6 Testing Entity

The Testing Entity is the institute or engineering office that performs the measurements for the MNPT. The Testing Entity can be any institute or engineering office.

Testing Entities meeting the requirements of chapter 5 are listed below:

- DEWI (Wilhelmshaven, Germany)
- ECN (Petten, the Netherlands)
- NREL (Boulder, Colorado, USA)
- DELTA – (Hørsholm, Denmark)
- WindConsult (Bargeshagen, Germany)
- Windtest Kaiser-Wilhelm-Koog (Kaiser-Wilhelm-Koog, Germany)
- Windtest Iberica (Madrid, Spain)
- Windtest America (contact Windtest KWK, Germany)
- Windtest Grevenbroich (Grevenbroich, Germany)
- Kötter Consulting Engineers (Rheine, Germany)

Testing Entities not on this list must be approved by Seller.

7 Reference Documents

7.1 Germany Only

FGW-Guideline Part 1, most current valid revision, at least Revision 17, Determination of sound emission values, Fördergesellschaft Windenergie e.V.

7.2 All Locations

IEC 61400-11, most current valid edition, at least ed. 2.1, 2006-11, Wind Turbine Generator Systems - Part 11: Acoustic Noise Measurement Techniques.

