GE Power & Water

– Original Instructions –

Technical Documentation
Wind Turbine Generator Systems
1.6-100 with LNTE
50 Hz and 60 Hz

Product Acoustic Specifications

Normal Operation according to IEC
Incl. Octave Band Spectra
Incl. 1/3rd Octave Band Spectra

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Table of Contents

1 Introduction 5
2 Normal Operation Calculated Apparent Sound Power Level 6
3 Uncertainty Levels 8
4 Tonal Audibility 8
5 IEC 61400-11 and IEC/TS 61400-14 Terminology 8
6 1/3rd Octave Band Spectra 8
Reference: 9
Appendix I - Calculated 1/3rd Octave Band Apparent Sound Power Level $L_{WA,k}$ 10

1 Introduction

This document summarizes the acoustic emission characteristics of the 1.6-100 with Low Noise Trailing Edge (LNTE) wind turbine for normal operation, including calculated apparent sound power levels $L_{WA,k}$, as well as uncertainty levels associated with the apparent sound power levels, tonal audibility, and calculated third octave band apparent sound power level.

All provided sound power levels are A-weighted.

GE continuously verifies specifications with measurements, including those performed by independent institutes. If a wind turbine noise performance test is carried out, it needs to be done in accordance with the regulations of the international standard IEC 61400-11, ed. 2.1: 2006 and Machine Noise Performance Test document.

2 Normal Operation Calculated Apparent Sound Power Level

The apparent sound power levels $L_{WA,k}$ are initially calculated as a function of the hub height wind speed v_{HH}. The corresponding wind speeds v_{10m} at 10 m height above ground level have been evaluated assuming a logarithmic wind profile. In this case a surface roughness of z_{0ref} = 0.05 m has been used, which is representative of average terrain conditions.

$$v_{10m} = v_{HH} \frac{\ln\left(10m / z_{0ref}\right)}{\ln\left(hub\ height / z_{0ref}\right)} \quad *$$

The calculated apparent sound power levels $L_{WA,k}$ and the associated octave-band spectra are given in Table 1 and Table 2 for two different hub heights. The values are provided as mean levels as a function of v_{10m} for Normal Operation (NO) over cut-in to cut-out wind speed range. The uncertainties for octave sound power levels are generally higher than for total sound power levels. Guidance is given in IEC 61400-11, Annex D.

1.6-100 with LNTE – Normal Operation Octave Spectra									
Standard wind speed at 10 m [m/s]		**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10-Cutout**
Hub height wind speed at 80 m [m/s]		**4.2**	**5.6**	**7.0**	**8.4**	**9.7**	**11.1**	**12.5**	**14-Cutout**
Frequency (Hz)	**31.5**	62.5	62.2	66.1	70.1	73.5	73.7	73.6	73.5
	63	72.1	71.9	75.9	80.3	84.0	84.1	84.1	84.0
	125	79.0	79.2	83.8	88.4	91.6	91.8	91.8	91.7
	250	84.0	84.6	89.4	94.7	95.4	95.3	95.4	95.5
	500	85.5	84.9	89.7	95.5	97.1	96.6	96.7	97.0
	1000	83.4	83.0	86.9	91.8	97.1	97.5	97.6	97.8
	2000	81.7	83.4	87.9	92.4	95.7	95.7	95.5	95.1
	4000	74.9	77.7	83.5	88.9	89.7	89.1	88.4	87.9
	8000	55.5	57.6	63.5	70.3	70.4	70.6	69.4	69.1
	16000	7.9	13.2	18.9	24.7	27.2	26.6	27.5	29.0
Total apparent sound power level $L_{WA.k}$ [dB]		**90.4**	**90.7**	**95.3**	**100.5**	**103.0**	**103.0**	**103.0**	**103.0**

Table 1: Normal Operation Calculated Apparent Sound Power Level, 1.6-100 with LNTE with 80 m hub height as a function of 10 m wind speed (z_{0ref} = 0.05 m), the octave band spectra are for information only

* Simplified from IEC 61400-11, ed. 2.1: 2006 equation 7

1.6-100 with LNTE – Normal Operation Octave Spectra									
Standard wind speed at 10 m [m/s]		**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10-Cutout**
Hub height wind speed at 96 m [m/s]		**4.3**	**5.7**	**7.1**	**8.6**	**10.0**	**11.4**	**12.8**	**14-Cutout**
Frequency (Hz)	**31.5**	62.4	62.4	66.6	70.6	73.7	73.7	73.6	73.5
	63	72.1	72.0	76.5	80.8	84.1	84.1	84.1	84.0
	125	79.0	79.5	84.4	89.0	91.6	91.8	91.8	91.7
	250	84.0	84.9	90.1	95.0	95.3	95.3	95.5	95.5
	500	85.4	85.0	90.3	96.0	96.8	96.6	96.8	97.0
	1000	83.4	83.1	87.5	92.4	97.2	97.4	97.7	97.8
	2000	81.8	83.7	88.5	92.9	95.8	95.7	95.4	95.1
	4000	75.1	78.2	84.2	89.3	89.7	88.8	88.4	87.9
	8000	55.7	57.9	64.4	70.7	71.1	69.8	69.3	69.1
	16000	8.4	13.6	19.5	25.2	27.3	26.4	27.8	29.0
Total apparent sound power level $L_{WA,k}$ [dB]		**90.4**	**90.9**	**96.0**	**101.0**	**103.0**	**103.0**	**103.0**	**103.0**

Table 2: Normal Operation Calculated Apparent Sound Power Level, 1.6-100 with LNTE with 96 m hub height as a function of 10 m wind speed (z_{0ref} = 0.05 m), the octave band spectra are for information only

At 10 m wind speeds lower than 5 m/s the sound power levels decreases, and may get so low that the wind turbine noise becomes indistinguishable from the background noise. For a conservative calculation the data at 5 m/s may be used.

For 10 m wind speeds above 10 m/s, the wind turbine has reached rated power and the blade pitch regulation acts in a way that tends to decrease the noise levels. For a conservative calculation the data at 10 m/s may be used.

The highest normal operation calculated apparent sound power level for the 1.6-100 with LNTE is $L_{WA,k}$ = 103.0 dB.

3 Uncertainty Levels

The apparent sound power levels given above are calculated mean levels. If a wind turbine noise performance test is carried out, it needs to be done in accordance with the regulations of the international standard IEC 61400-11, ed. 2.1: 2006. Uncertainty levels associated with measurements are described in IEC/TS 61400-14.

Per IEC/TS 61400-14, L_{WAd} is the maximum apparent sound power level for 95 % confidence level resulting from n measurements performed according to IEC 61400-11 standard: $L_{Wad} = L_{WA} + K$, where L_{WA} is the mean apparent sound power level from IEC 61400-11 testing reports and $K = 1.645\ \sigma_T$.

The testing standard deviation values σ_T, σ_R and σ_P for measured apparent sound power level are described by IEC/TS 61400-14, where σ_T is the total standard deviation, σ_P is the standard deviation for product variation and σ_R is the standard deviation for test reproducibility.

Assuming $\sigma_R < 0.8$ dB and $\sigma_P < 0.8$ dB as typical values leads to a calculated $K < 2$ dB for 95 % confidence level.

4 Tonal Audibility

The tonal audibility ($\Delta L_{a,k}$), when measured in accordance with the IEC 61400-11 standard, for the GE's 1.6-100 with LNTE is less than or equal to 2 dB.

5 IEC 61400-11 and IEC/TS 61400-14 Terminology

- $L_{WA,K}$ is wind turbine apparent sound power level (referenced to 10^{-12}W) measured with A-weighting as function of reference wind speed v_{10m}. Derived from multiple measurement reports per IEC 61400-11, it is considered as a mean value
- σ_P is the product variation i.e. the 1.6-100 with LNTE unit-to-unit product variation; typically < 0.8 dB
- σ_R is the overall measurement testing reproducibility as defined per IEC 61400-11; typically < 0.8 dB with adequate measurement conditions and sufficient amount of data samples
- σ_T is the total standard deviation combining both σ_P and σ_R
- $K = 1.645\ \sigma_T$ is defined per IEC/TS 61400-14 for 95 % confidence level
- R_0 is the ground measuring distance from the wind turbine tower axis per IEC 61400-11, which shall equal the hub height plus half the rotor diameter
- $\Delta L_{a,k}$ is the tonal audibility according to IEC 61400-11, described as potentially audible narrow band sound

6 1/3rd Octave Band Spectra

The tables in Annex I are showing the 1/3rd octave band values for different hub heights in different wind speeds.

Reference:

- IEC 61400-1. Wind turbines – part 1: Design requirements. ed. 2. 1999
- IEC 61400-11, wind turbine generator systems part 11: Acoustic noise measurement techniques, ed. 2.1, 2006-11
- IEC/TS 61400-14, Wind turbines – part 14: Declaration of apparent sound power level and tonality values, ed. 1, 2005-03
- MNPT – Machine Noise Performance Test, Technical documentation, GE 2011

Appendix I - Calculated 1/3rd Octave Band Apparent Sound Power Level $L_{WA,k}$

1.6-100 with LNTE - Normal Operation 1/3rd Octave Band Spectra									
Standard wind speed at 10 m [m/s]		3	4	5	6	7	8	9	10-Cutout
Hub height wind speed at 80 m [m/s]		4.2	5.6	7.0	8.4	9.7	11.1	12.5	14-Cutout
Frequency (Hz)	25	52.2	52.1	55.8	59.7	63.0	63.2	63.1	62.9
	32	56.6	56.4	60.2	64.2	67.5	67.7	67.7	67.5
	40	60.6	60.3	64.2	68.3	71.6	71.9	71.8	71.7
	50	63.7	63.5	67.4	71.6	75.0	75.2	75.2	75.0
	63	66.5	66.2	70.3	74.6	78.1	78.3	78.3	78.2
	80	69.7	69.5	73.6	78.0	81.8	82.0	81.9	81.8
	100	72.3	72.2	76.5	81.0	84.8	84.9	84.9	84.7
	125	74.1	74.2	78.7	83.3	86.6	86.9	86.9	86.8
	160	75.6	76.1	80.8	85.6	88.3	88.5	88.6	88.5
	200	77.5	78.1	83.0	87.9	89.7	89.9	90.0	90.0
	250	79.5	80.1	85.0	90.2	91.0	90.9	91.0	91.1
	315	80.3	80.7	85.6	91.0	91.1	90.8	90.8	91.0
	400	80.7	80.6	85.4	91.1	91.5	91.0	91.0	91.2
	500	81.0	80.4	85.1	91.0	92.4	91.9	91.9	92.2
	630	80.3	79.4	84.0	89.9	92.9	92.6	92.7	93.0
	800	79.0	78.0	82.3	87.8	92.6	92.6	92.7	93.0
	1000	78.4	77.9	81.7	86.4	92.3	92.7	92.8	93.0
	1250	78.5	78.7	82.4	86.6	92.1	92.8	92.9	93.0
	1600	77.9	78.7	82.8	87.0	91.4	91.9	91.9	91.6
	2000	77.0	78.8	83.3	87.8	91.1	91.0	90.6	90.2
	2500	75.7	78.5	83.4	88.1	90.4	89.7	89.1	88.6
	3150	73.2	76.1	81.8	86.9	88.1	87.2	86.7	86.1
	4000	69.1	71.7	77.7	83.5	83.6	83.5	82.5	82.2
	5000	63.7	65.4	72.0	78.0	78.0	78.2	76.7	76.7
	6300	55.3	57.3	63.3	70.0	70.1	70.2	69.1	68.7
	8000	42.6	45.5	51.0	57.4	58.6	58.8	57.9	57.4
	10000	27.1	31.3	36.5	42.5	44.6	44.4	44.4	44.4
	12500	7.9	13.2	18.9	24.6	27.2	26.6	27.4	29.0
	16000	-19.0	-13.2	-6.1	-0.3	1.9	1.8	4.0	6.3
	20000	-47.8	-42.5	-34.1	-26.9	-25.9	-24.6	-21.8	-19.1
Total apparent sound power level $L_{WA,k}$ [dB]		90.4	90.7	95.3	100.5	103.0	103.0	103.0	103.0

Table 3: Calculated Apparent 1/3rd Octave Band Sound Power Level (A-weighted) 1.6-100 with LNTE with 80 m hub height as Function of Wind Speed v_{10m}

1.6-100 with LNTE - Normal Operation 1/3rd Octave Band Spectra									
Standard wind speed at 10 m [m/s]		**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10-Cutout**
Hub height wind speed at 96 m [m/s]		**4.3**	**5.7**	**7.1**	**8.6**	**10.0**	**11.4**	**12.8**	**14-Cutout**
Frequency (Hz)	**25**	52.1	52.2	56.4	60.2	63.2	63.2	63.1	62.9
	32	56.6	56.5	60.7	64.7	67.7	67.7	67.6	67.5
	40	60.6	60.5	64.7	68.8	71.8	71.9	71.8	71.7
	50	63.7	63.6	67.9	72.1	75.2	75.2	75.2	75.0
	63	66.5	66.4	70.8	75.1	78.3	78.3	78.3	78.2
	80	69.7	69.7	74.2	78.6	81.9	81.9	81.9	81.8
	100	72.3	72.4	77.0	81.5	84.9	84.9	84.9	84.7
	125	74.0	74.5	79.3	83.8	86.7	86.9	86.9	86.8
	160	75.6	76.4	81.4	86.1	88.3	88.5	88.6	88.5
	200	77.5	78.5	83.6	88.4	89.7	89.9	90.0	90.0
	250	79.5	80.4	85.6	90.6	90.9	90.9	91.1	91.1
	315	80.3	81.0	86.2	91.4	90.9	90.8	90.9	91.0
	400	80.7	80.8	86.1	91.5	91.2	90.9	91.1	91.2
	500	80.9	80.5	85.8	91.5	92.1	91.8	92.0	92.2
	630	80.3	79.4	84.7	90.5	92.7	92.6	92.8	93.0
	800	78.9	78.1	82.9	88.5	92.5	92.5	92.8	93.0
	1000	78.3	78.1	82.2	87.2	92.5	92.6	92.9	93.0
	1250	78.5	78.8	82.9	87.2	92.4	92.8	93.0	93.0
	1600	77.9	78.9	83.3	87.5	91.6	91.9	91.9	91.6
	2000	77.1	79.1	83.9	88.3	91.1	90.9	90.6	90.2
	2500	75.9	78.8	84.0	88.6	90.3	89.6	89.0	88.6
	3150	73.4	76.5	82.4	87.3	87.9	87.0	86.6	86.1
	4000	69.2	72.2	78.4	83.8	83.7	83.2	82.5	82.2
	5000	63.8	65.9	72.8	78.3	78.4	77.5	76.8	76.7
	6300	55.4	57.6	64.1	70.4	70.8	69.4	69.0	68.7
	8000	42.9	45.8	51.8	57.9	59.1	58.4	57.7	57.4
	10000	27.5	31.6	37.2	43.0	44.9	44.1	44.4	44.4
	12500	8.4	13.6	19.5	25.2	27.3	26.4	27.8	29.0
	16000	-18.5	-12.7	-5.4	0.2	1.8	2.0	4.6	6.3
	20000	-47.5	-41.9	-33.2	-26.3	-26.0	-24.1	-21.1	-19.1
Total apparent sound power level $L_{WA.k}$ [dB]		**90.4**	**90.9**	**96.0**	**101.0**	**103.0**	**103.0**	**103.0**	**103.0**

Table 4: Calculated Apparent 1/3rd Octave Band Sound Power Level (A-weighted), 1.6-100 with LNTE with 96 m hub height as Function of Wind Speed v_{10m}

Extract I of test report

Master Information „Noise", according to "Wind turbine generator systems - Part 11: Acoustic noise measurement techniques."

IEC 61400-11 ED. 2 from 2002 (published by: Central Office of the IEC, Geneva, Switzerland)

Extract of test report WICO 439SEC04/07 regarding noise emission of wind turbine (WT)

type ENERCON E-48 (Mode I), hub height 75.6 m

General			Technical specifications (manufacturer)	
Manufacturer:	ENERCON GmbH		Rated power (generator):	800 kW
	Dreekamp 5		Rotor diameter:	48,0 m
	D-26605 AURICH		Hub height above ground:	75,6 m
Serial number:	48087		Kon. Stahlrohr	Tubular steel tower
WT-location:	WP Holtriem	RW 25.95.228	Pitch	pitch/stall/active-stall
		HW 59.42.988		

Complementations of rotor (manufacturer)		Complementations of gear and generator (manufacturer)	
Manufacturer of rotor blades	ENERCON GmbH	Manufacturer of gear:	No
Type of blades:	E48/1	Type of gear:	No
Pitch angle:	variabel	Manufacturer of generator:	ENERCON GmbH
Number of blades	3	Type of generator:	E-48
Rated speed(s)/speed range:	16 – 29,5 rpm (Mode I)	Rated speed(s):	16 – 29,5 rpm (Mode I)

Report power curve: calculated power curve, date: 31.08.2004

	Reference		Noise emission parameter	Remarks
	Standardized wind speed at 10 m above ground	Electric power		
Sound power level L_{WA}	*5 ms^{-1}*	*182 kW*	*94.0* dB(A)*	*(1)*
	6 ms^{-1}	315 kW	97.8 dB(A)	
	7 ms^{-1}	499 kW	100.3 dB(A)	
	8 ms^{-1}	671 kW	101.4 dB(A)	
	8.9 ms^{-1}	*760 kW*	*101.9 dB(A)*	*(2)*
	9 ms^{-1}	765 kW	102.0 dB(A)	
	9.6 ms^{-1}	*794 kW*	*102.1 dB(A)*	*(3)*
	10 ms^{-1}	800 kW	101.9 dB(A)	(4)
Tonal components ΔL_a (near proximity)	*5 ms^{-1}*	*182 kW*	No tone	*(1)*
	6 ms^{-1}	315 kW	No tone	
	7 ms^{-1}	499 kW	No tone	
	8 ms^{-1}	671 kW	No tone	
	8.9 ms^{-1}	*760 kW*	No tone	*(2)*
	9 ms^{-1}	765 kW	*No tone*	
	9.6 ms^{-1}	*794 kW*	No tone	*(3)*
	10 ms^{-1}	800 kW	*No tone*	(4)

One third octave sound power level at reference point v_{10} = 5 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	67.6	71.2	72.9	74.5	78.0	77.0	79.3	84.2	85.6	84.6	84.2	84.4
L_{WA}	75.8			81.5			88.5			89.2		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	82.6	82.0	81.4	79.2	78.5	76.6	75.2	74.8	73.1	72.4	70.9	67.4
L_{WA}	86.8			83.0			79.2			75.5		

One third octave sound power level at reference point v_{10} = 6 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	71.7	74.2	76.9	77.6	78.8	79.7	80.6	86.1	87.8	87.4	87.4	89.0
L_{WA}	79.5			83.6			90.5			92.8		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	88.3	88.1	86.9	84.0	82.4	80.9	79.4	79.0	78.1	77.3	74.9	72.9
L_{WA}	92.6			87.4			83.6			80.2		

One third octave sound power level at reference point v_{10} = 7 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	72.7	76.1	79.3	80.5	80.9	82.9	84.3	89.2	91.2	90.7	90.5	91.5
L_{WA}	81.6			86.3			93.8			95.7		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	90.2	89.7	87.9	85.5	84.1	82.6	81.7	81.6	80.7	80.2	79.2	76.3
L_{WA}	94.1			89.0			86.1			83.6		

One third octave sound power level at reference point v_{10} = 8 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	70.1	74.3	77.3	79.0	81.7	82.3	84.4	90.5	92.7	92.0	91.9	92.9
L_{WA}	79.6			86.0			95.1			97.1		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	91.7	90.9	89.1	86.0	83.9	82.1	80.9	81.6	80.6	79.7	79.2	77.3
L_{WA}	95.5			89.1			85.8			83.6		

One third octave sound power level at reference point v_{10} = 9 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	71.8	74.5	77.1	79.4	82.6	84.2	86.6	91.5	93.5	92.6	92.3	93.1
L_{WA}	79.8			87.3			96.1			97.5		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	91.4	90.5	88.7	86.2	85.0	84.3	83.9	84.4	83.9	83.7	82.5	80.1
L_{WA}	95.1			90.0			88.8			87.1		

One third octave sound power level at reference point v_{10} = 9.6 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	69.9	73.9	75.9	77.4	80.2	80.7	83.4	88.3	91.0	90.8	91.5	93.4
L_{WA}	78.6			84.4			93.3			96.8		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	93.2	93.6	92.6	89.9	87.4	85.0	83.2	83.3	82.0	81.1	79.9	77.8
L_{WA}	97.9			92.7			87.6			84.6		

(1) Because of the signal to noise ratio laying in between 3 dB to 6 dB the sound pressure level was corrected with 1.3 dB.
(2) Sound power level at 95% of the rated power.
(3) Wind speed at the maximum sound pressure level minute measured.
(4) One value was measured in the wind bin of 10 ms^{-1}.

This extract of test report is valid only in connection with the enclosed „Manufacturer's certificate" from 2004-08-31.

This declaration does not replace above-mentioned report.

measured by: WIND-consult GmbH
Reuterstraße 9
D-18211 Bargeshagen

- pdf - document was signed electronically -

date: 2006-01-24

Dipl.-Ing. A. Petersen

Dipl.-Ing. W. Wilke

Deutscher Akkreditierungs Rat
DAR
DAP-PL-2756.00
According to DIN EN ISO 17025 by the DAP German Accreditation System for Testing Ltd. accredited testing laboratory.
The accreditation is valid for test methods listed in the document.

SWT-3.0-113, Rev. 0, Max. Power 2483 kW
Contract Acoustic Emission, Hub Height 99.5 m
Ontario - Canada

Sound Power Levels

The warranted sound power level is presented with reference to the code IEC 61400-11:2002 with amendment 1 dated 2006-05 based on a hub height of 99.5 m and a roughness length of 0.05 m as described in the IEC code. The sound power levels (LWA) presented are valid for the corresponding wind speeds referenced to a height of 10 m above ground level.

Wind speed [m/s]	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Up to cut-out**
Max. Power 2483kW	95.1	99.3	101.3	101.5	101.5	101.5	101.5	101.5	101.5	101.5

Table 1: Acoustic emission, L_{WA} [dB(A) re 1 pW]

Typical Sound Power Frequency Distribution

Typical spectra for L_{WA} in dB(A) re 1pW for the corresponding centre frequencies are tabulated below for 6 - 10 m/s referenced to a height of 10.0 m above ground level.

	Wind Speed (m/s)				
Octave band, centre frequency [Hz]	**6**	**7**	**8**	**9**	**10**
63	89.4	90.5	91.2	91.3	91.1
125	92.2	92.5	92.6	92.1	91.4
250	95.5	95.2	94.7	94.1	93.5
500	93.7	93.5	93.1	92.9	92.8
1000	93.3	93.4	93.4	93.3	93.7
2000	92.7	93.4	93.8	94.0	94.6
4000	89.5	90.2	90.6	92.5	92.8
8000	80.7	82.3	83.3	83.3	83.4

Table 2: Typical octave bands for 6-10 m/s, L_{WA} [dB(A) re 1 pW]

Tonality

Typical tonal audibility for the Siemens wind turbine generators has not exceeded 2 dB as determined in accordance with IEC 61400-11:2002.

Measurement Uncertainty

A measurement uncertainty range of -1.5dB(A) to +1.5dB(A) is applicable.

Appendix C: Noise contour maps

Noise contours calculated at 4.5 metres above grade

Legend

- Wind Energy Centre Study Area
- Goshen Transmission Line Study Area
- 120m Area of Investigation
- Municipal Division
- Roads

Natural Features

- Watercourse (ABCA, UTRCA)
- Watercourse (MNR)
- Waterbody
- Wooded Area
- Zurich Wind Turbine
- Grand Bend Wind Farm

Receptors

- Non-participating Receptor
- Participating Receptor
- Vacant Lot Non-participating Receptor
- Vacant Lot Participating Receptor

Project Location

- GE Turbine
- Permanent Meterological Tower
- Access Road
- Collection Line
- Transmission Line
- Temporary Laydown Area
- Breaker Switch Station
- Transformer Substation
- Disturbance Area
- Existing 500kV Transmission Line

Noise Results

- 40.0 dBa

Lake Huron

South Huron

Metres
0 500 1,000 1,500 2,000
1:50,000
UTM Zone 17N, NAD 83

Goshen Wind Energy Centre
Noise Modelling Assessment

Noise Modelling
Wind Speed = 6m/s

July 2014
Project 60155032

AECOM

Map Document: (N:\projects\0-aecom\60155032\2010\FinalGIS\Spatial\MXDs\ReportMXDs\NHA_Mapping\60155032_Bluewater_NaturaeFeatureRecReview.mxd)
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