

GRAND BEND EMISSION ACOUSTIC REPORTS

Revision 00

Grand Bend Wind Farm

Grand Bend, Ontario

Report Number: 02.0031.004

Project Number: 02.0031

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November 29, 2016

EXECUTIVE SUMMARY

Howe Gastmeier Chapnik Limited (“HGC Engineering”) was retained by Northland Power Inc., on behalf of Grand Bend Wind Limited Partnership, to complete Acoustic Noise testing in accordance with IEC 61400-11 of two wind turbine generators at the Grand Bend Wind Farm near Grand Bend, Ontario. The Acoustic Emission Audit is required as a Condition F of Renewable Energy Approval number 5186-9HBJXR issued by the Ontario Ministry of the Environment and Climate Change (“MOECC”) on June 26, 2014. This report represents measurements of the two test turbines completed on October 13 and 24, 2016.

HGC Engineering has assessed two Siemens SWT 3.0-113 wind turbines in accordance with CAN/CSA-C61400-11:13 (IEC 61400-11:2012). The two turbines each have a rated electrical power of 2483 kW. A summary of the sound power levels as measured by HGC Engineering and provided by the manufacturer are outlined in the following table. Detailed results are provided in the attached turbine reports.

Turbine ID	Sound Power Levels, $L_{WA,k}$ [dBA] as Measured by HGC Engineering vs Hub Height Wind Speed [m/s]										Manufacturer’s Rated Sound Power [dBA]
	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	
WTG T05	100.3	100.5	100.8	100.8	101.1	101.0	100.9	101.2	101.0	100.7	101.5
WTG T19	100.8	101.0	101.0	101.0	100.9	100.8	100.8	101.0	101.0	100.8	101.5

TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
1 INTRODUCTION	4
2 MEASUREMENTS AND RESULTS	4
3 CONCLUSIONS	5

ATTACHED:

REPORT 02.0031.002 – WTG T05 (2483 kW) ACOUSTIC REPORT

REPORT 02.0031.003 – WTG T19 (2483 kW) ACOUSTIC REPORT



ACOUSTICS



NOISE



VIBRATION

1 INTRODUCTION

Howe Gastmeier Chapnik Limited (“HGC Engineering”) was retained by Northland Power Inc., on behalf of Grand Bend Wind Limited Partnership, to complete sound level measurements (Emission Audit) of two Siemens SWT 3.0-113 Wind Turbine Generators (“WTG”), with rated capacities of 2483 kW, to determine the sound power level of each turbine. These turbines are part of the Grand Bend Wind Farm which includes 40 Siemens turbines, with an overall project nameplate capacity of 100 MW. Measurements were completed between October 13 and 24, 2016.

This report summarizes measurements that were completed in accordance with IEC Standard 61400-11 “Wind turbine generator systems – Part 11: Acoustic Noise Measurement Techniques”. The CAN/CSA-C61400-11:13 standard is an adoption without modification of the identically titled IEC Standard IEC 61400-11:2012 [1].

2 MEASUREMENTS AND RESULTS

Sound level measurements were conducted at each turbine as listed in Table 1 below.

Table 1: Measurement Periods

Turbine ID	Measurement Date
WTG T05	October 13, 2016
WTG T19	October 24, 2016

Additional details related to instrumentation, measurement procedures, and detailed results are provided in the attached reports for each turbine. The overall results are shown in Table 2 below.

Table 2: Emission Testing Summary Results

Turbine ID	Parameters Measured by HGC Engineering	Hub Height Wind Speed [m/s]									
		7.5	8	8.5	9	9.5	10	10.5	11	11.5	12
WTG T05	Sound Power Level $L_{WA,k}$ [dBA]	100.3	100.5	100.8	100.8	101.1	101.0	100.9	101.2	101.0	100.7
	Tonal Audibility, ΔL_{ak} [dB]	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	-2.8	-2.5	-2.9	-1.5
	Total Uncertainty U_c [dB]	0.8	0.9	0.8	0.9	0.9	0.8	0.9	0.9	1.0	1.0
WTG T19	Sound Power Level $L_{WA,k}$ [dBA]	100.8	101.0	101.0	101.0	100.9	100.8	100.8	101.0	101.0	100.8
	Tonal Audibility, ΔL_{ak} [dB]	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0	<-3.0
	Total Uncertainty U_c [dB]	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8

3 CONCLUSIONS

The results of the acoustic measurements and analysis indicate that, for all measured wind speeds, the wind turbine generators meet the specified sound power levels in Renewable Energy Approval Number 5186-9HBJXR [2]. Additionally, the acoustic measurements and analysis indicate that the tonal audibility is less than the maximum tonal audibility noted in the Environmental Noise Impact Assessment Report [3].

Detailed results are provided in the attached turbine reports.

REFERENCES

1. International Electrotechnical Commission, 61400-11: 2012 *Wind turbine generator systems – Part 11: Acoustic noise measurement techniques*.
2. Ontario Ministry of the Environment Renewable Energy Approval Number 5186-9HBJXR, dated June 26, 2014
3. Aercoustics Engineering Limited, *Grand Bend Wind Farm, Environmental Noise Impact Assessment Report*, dated April 15, 2014.



ACOUSTICS



NOISE



VIBRATION