
**South Branch Wind Farm
Acoustic Audit - Emission**
Summary for Public Distribution

■ Introduction

The South Branch Wind Farm (project) operates 10 Siemens SWT-3.0-113 wind turbines located within the Township of South Dundas in the United Counties of Stormont, Dundas and Glengarry. As part of the Renewable Energy Approval (REA) application process, a pre-construction acoustic computer model was created in order to satisfy the requirements of the Ministry of Environment and Climate Change (MOECC) sound level limits. This model used sound level of the wind turbines provided by the manufacturer.

In order to confirm the manufacturer-specified sound levels used in the acoustic model and ensure, the project's REA requires that an Acoustic Audit . Emission+is done once the project is in operation.

The Acoustic Audit . Emission+is a process that measures the sound level of a project wind turbine specifically using the methods prescribed in the IEC 61400-11 test standard. The results of the measurement are then compared to the maximum permitted sound levels of the wind turbines as set out in the REA.

The REA for South Branch requires that an Emission audit be conducted on two (2) turbines in the wind farm. The acoustic emission audits were completed in November 2014, and were documented in two separate acoustic audit reports that have been submitted to the MOECC (both reports dated January 15, 2015). The project was found to be in compliance with the Noise Performance Limits as set out in the REA.

The MOECC provided feedback to South Branch regarding the emission audit reports in a letter dated July 11, 2017. Based on that feedback, South Branch has reprocessed and resubmitted the test data collected in 2014. The following provides a summary of the results of the acoustic emission audit reports.

■ How does a wind turbine create noise?

The main sources of noise associated with the operation of a wind turbine can be divided into two main categories:

- Aerodynamic noise - considered the dominant source of noise and is generated by the turbine blades passing through the air.
- Mechanical noise - is generated by different components in the hub such as the direct drive generator.

At short distances from the turbine, the aerodynamic noise from the rotating blades can be noticeable. As the distance from the turbine increases, the aerodynamic noise and mechanical noise are less pronounced and ambient sound levels can sometimes mask the audibility of the turbine noise. To avoid this issue, the IEC 61400-11 test standard mandates testing be done at a location close to the turbine (typically 120-170m away).

- The measured turbines

The acoustic emission audit measurements were conducted on two turbines, turbine T07 and turbine T08. Locations of both turbines are provided in the figure below.

Measured Wind Turbines



■ How was the study done?

The acoustic emission measurements required in the REA were performed by Aercoustics, an Independent Acoustical Consultant, on two (2) separate turbines; T07 and T08. Both measurements were conducted in November of 2014. The acoustic audits were completed in accordance with the IEC 61400-11 test standard.

A microphone was placed on a measurement board at ground level, 156.5 meters from the turbine in the downwind direction. A weather anemometer was also erected at a height of 10 meters, 230 meters from the turbine in the upwind direction. The figures below show photos of the measurement equipment used for the testing at turbine T08.



For the duration of the measurement time, acoustic and weather data are logged simultaneously in 10-second intervals. Measurements are conducted when the turbine was operational (Turbine ON) as well as when the turbine was parked (Turbine OFF) in order to quantify the ambient sound level. The microphone board was periodically moved to ensure that all Turbine ON measurements were conducted in a downwind position.

During the test, any nearby turbines were parked. Each test lasted for one measurement day, and was attended by Aercoustics personnel.

Turbine Only sound is determined by correcting Turbine ON data points by logarithmically subtracting Turbine OFF valid data points. The resulting Turbine Only sound pressure level is then converted to a sound power level using the known distance from the measurement board to the turbine rotor centre. The sound power level results are then compared to the permitted turbine sound level described in Schedule B of the REA.

▪ **What are the REA Sound Power Level Limits?**

The purpose of the sound measurements was to confirm whether the sound emitted by the project turbine is in compliance with the permitted sound levels described in Schedule B of the project REA. The permitted sound level for all South Branch turbines is shown in the table below.

Source ID	Maximum Sound Power Level (dBA)	Easting (m)	Northing (m)	Equipment description
SWT01	105.5	463955	4973451	Siemens model SWT-3.0-113 3MW
SWT02	105.5	464274	4973747	Siemens model SWT-3.0-113 3MW
SWT03	105.5	464593	4973522	Siemens model SWT-3.0-113 3MW
SWT04	105.5	464848	4974070	Siemens model SWT-3.0-113 3MW
SWT05	105.5	469331	4981383	Siemens model SWT-3.0-113 3MW
SWT06	105.5	469791	4981543	Siemens model SWT-3.0-113 3MW
SWT07	105.5	470572	4980031	Siemens model SWT-3.0-113 3MW
SWT08	105.5	471094	4980234	Siemens model SWT-3.0-113 3MW
SWT09	105.5	470765	4976717	Siemens model SWT-3.0-113 3MW
SWT10	105.5	471904	4977880	Siemens model SWT-3.0-113 3MW
SWT11	105.5	472196	4978405	Siemens model SWT-3.0-113 3MW
SWT12	105.5	472795	4979009	Siemens model SWT-3.0-113 3MW
SWT13	105.5	472713	4979350	Siemens model SWT-3.0-113 3MW
SWT15	105.5	472526	4975715	Siemens model SWT-3.0-113 3MW
Transformer Substation	100.2	472339	4975747	Transformer Substation 33 MVA

The sound power level of the transformer substation has been tested separately, and complies with the limits described above.

Note that Section E3.1 of the MOECC Compliance Protocol for Wind Turbine Noise allows for an exceedance of up to 0.5 dB on the sound power level in the REA. This effectively results in a nominal measured sound power level requirement of 106.0 dBA for all turbines.

■ What were the results?

The emission audit results for both turbines demonstrate that the Project is operating in full compliance with the maximum sound power level permitted in the project REA. The emission test reports have been submitted to the MOECC to satisfy the requirements of Condition F of the project's REA and are currently under the review process. Maximum tested sound power level at the two turbines are presented in Table 1.

Table 1: South Branch Immission Audit Results - Phase 1

Test Turbine ID	Maximum Measured Sound Power Level	Permitted Sound Level*
T07	105.7 dBA	106.0 dBA
T08	105.5 dBA	106.0 dBA

* Permitted sound level includes the +0.5 dB allowed per the Section E3.1 of the [MOECC Compliance Protocol for Wind turbine noise](#)

Questions or further clarification on this audit can be directed to the Project team at southbranch@edpr.com or phone 1-416-502-9463.