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## **Attachment E**

Memo – Supporting Information for REA Amendment Application

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December 13, 2021

Aercoustics Project #: 16115.01

## **Ministry of the Environment, Conservation, and Parks**

*Client Services and Permissions Branch*

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ATTN: Director, Client Services and Permissions Branch

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Subject: Nation Rise Wind Farm – REA #0871-AV3TFM  
Supporting Information for REA Administrative Amendment application

This memo provides supporting evidence and rationale to the application for amendment of the Nation Rise Wind Farm (the “Facility”) Renewable Energy Approval (“REA”) #0871-AV3TFM. The application proposes to amend condition E3 to extend the deadline for submission of the Acoustic Audit Report – Transformer Substation to **twelve (12) months** after the commencement of the operation of the facility. The proposed amendment is supported by the following details:

- The Acoustic Audit – Transformer Substation specifies the use of IEEE standard C57.12.90. The most recent version of this test standard (2015) requires testing of the transformer while the wind farm is producing at or near its maximum rated capacity. For a wind facility, high power output is achieved when wind speeds are high and most, if not all, of the wind turbines are operating.
- Over the past several months, the Facility has had many turbines kept offline due to supply chain issues disrupting and delaying part deliveries, limiting maintenance and troubleshooting work. As a result, there were no opportunities where testing could be carried out under the required conditions.

Viable opportunities for the Acoustic Audit – Transformer Substation were originally anticipated in the Fall 2021 season, given the Facility's May 14, 2021 commercial operation date and with wind resources in the summer being typically low. During the Fall 2021 season, the required test conditions could not be captured due to turbines being offline. These issues with offline turbines were only very recently resolved, with insufficient time to complete the acoustic audit before the six-month deadline in REA Condition E3.

It is important to note that no modifications to the facility operations or infrastructure are proposed in this amendment, and therefore the environmental impacts remain unchanged from the original Approval.

## 1 Requested Amendments

The following amendment to REA #0871-AV3TFM is proposed:

### Condition E3

*The company shall carry out an Acoustic Audit – Transformer Substation and shall submit to the Director and the District Manager an Acoustic Audit Report – Transformer Substation prepared by an Independent Acoustical Consultant, in accordance with Ministry Publication NPC-233, "Information to be Submitted for an Approval of Stationary Sources of Sound", October, 1995 as amended, and no later than **twelve (12) months** after the commencement of operation of the Facility.*

Justification for the proposed amendment is detailed in the following sections.

## 2 Acoustic Audit – Transformer Substation Test Conditions

Per the Nation Rise REA, the Acoustic Audit – Transformer Substation must follow IEEE standard C57.12.90. The most recent version of this test standard (C57.12.90-2015) prescribes assessment of the *Load audible sound* (Section 13.1.1):

Figure 1: Introduction - Audible sound emissions - IEEE 57.12.90-2015

Audible sound from transformers is composed of the following three components:

- a) *Core audible sound:* This sound component originates in the transformer core and transmits through the dielectric fluid and structural supports to the tank, where it radiates as airborne sound. The frequency spectrum of core sound consists primarily of the even harmonics of the power frequency; thus, for a 60 Hz power system, the main frequency components are 120, 240, 360, and 480 Hz.
- b) *Load audible sound:* This sound component is primarily produced by vibrations of the windings and tank walls when the transformer is loaded. The frequency of this sound component is primarily twice the power frequency i.e., 120 Hz for a 60 Hz transformer. When a transformer is highly loaded, load sound can be a significant contributor to the total sound of the transformer, especially for low no-load noise medium and large power transformers. The magnitude of load sound is highly dependent on the transformer load. For example, load sound level at 60% of full load is about 9 dB lower than that at full load.
- c) *Cooling system audible sound:* The frequency spectrum of this sound component typically consists of broadband fan noise, plus discrete tones (of low levels) at the fan blade passage frequency and its harmonics.

Accordingly, the Acoustic Audit – Transformer Substation must be carried out in conditions where the transformer is subjected to loading at or near its rated capacity. Historically, a site-wide power production of 85% of the total rated capacity<sup>1</sup> has been used when carrying out transformer emission testing as the threshold for the ‘highly loaded’ transformer condition.

This viable test condition therefore corresponds to periods where the Nation Rise Wind Farm is producing approximately 85 MW or greater of its rated 100 MW capacity. Other acoustical considerations also apply when assessing test conditions, including minimal precipitation and ambient noise.

### 3 Limited Site-Wide Turbine Operation

Several turbines were unexpectedly inoperative for extended periods of time due to unexpected maintenance delays driven mainly by supply chain constraints on turbine parts and on-site labour shortages. These issues led to delays in troubleshooting the offline turbines and restoring them to full service.

Per the supporting information provided in Attachment F, the site-wide average production could not approach anywhere close to 85% of rated capacity for any one-week period.

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<sup>1</sup> This threshold is derived from Section D5.2 of the Compliance Protocol for Wind Turbine Noise (2017).

Accordingly, the Acoustic Audit – Transformer Substation could not be carried out according to the IEEE 57.12.90-2015 standard.

#### **4 Closure**

Rationale and evidence have been provided in this memo in support of an amendment to the Nation Rise Wind Farm REA #0871-AV3TFM to extend the deadline for submission of the Acoustic Audit Report – Transformer Substation outlined in Condition E3 of the REA to twelve (12) months after the commencement of the operation of the facility.

The proposed amendment will result in no change to the environmental impact of the Nation Rise Wind Farm and will allow additional time to carry out the Acoustic Audit – Transformer Substation testing. Efforts will be made to carry out Condition E3 of the Nation Rise REA as soon as possible.

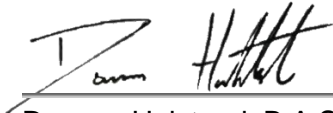
If you have any questions regarding the content of the memo, please do not hesitate to contact the author.

Sincerely,

**AERCOUSTICS ENGINEERING LIMITED**



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