

TECHNICAL MEMORANDUM

Title: Noise Model Update

Project: Buckeye Wind
Location: Champaign County, OH
Prepared For: Champaign Wind, LLC & Buckeye Wind, LLC
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Revision: B
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Attachments: **Plot 1** Buckeye I Sound Contours
Plot 2 Buckeye II Sound Contours
Plot 3 Sound Contours from Both Phases

1.0 Introduction

The sound emissions from Phases I and II of the Buckeye Wind Project and their potential impact on residents in the local area have been under study since 2007 and were most recently evaluated in March of 2012 in our Report 1905-010512, Rev. D, “Environmental Sound Survey and Noise Impact Assessment, Buckeye II Wind Project”. Since that time a number of turbines have been eliminated from the design so that the overall project now consists of 55 turbines generally located in the northern part of the original site area. Because of these changes we have been tasked by Champaign Wind, LLC and Buckeye Wind, LLC with revising and updating the noise model of the project to reflect its current configuration and to re-evaluate the project’s compliance with the Ohio Power Siting Board’s (OPSB’s) effective noise limits per its Opinion, Order and Certificate for each phase. This report briefly summarizes the results of this update.

2.0 Effective Noise Limits

The Buckeye Wind Project consists of two phases, which have been evaluated and permitted separately by the Ohio Power Siting Board. The effective noise limits for each phase, as stated in the OPSB’s Opinion, Order and Certificate for each project, are summarized below.

2.1 Buckeye I

Section V. F.8.e.iv. and Condition (6) of the final Opinion, Order and Certificate for Buckeye I (Case No. 08-666-EL-BGN) dated 3/22/10 generally specify that the sound emissions from the project shall be consistent with the noise model predictions as presented in our Report 1819-041708-C, 3/12/09. No specific absolute noise limit is mandated. For the purposes of comparison, the most relevant design goal discussed and modeled in the 2009 assessment was a maximum project sound level of 43 dBA at night at non-participating residences. This level represents a 5 dBA increase over the nighttime Leq background sound level of 38 dBA measured during “critical” 5 m/s wind conditions when project audibility would be at a maximum.

2.2 Buckeye II

Section VI.F.2.g. and Condition (46) of the final Opinion, Order and Certificate for Buckeye II (Case No. 12-160-EL-BGN) dated 3/28/13 limits the nighttime sound emissions from the project to an increase of 5 dBA above the measured nighttime Leq background level of 39 dBA – or 44 dBA at non-participating residences. The same limit applies during the day except that if a higher background Leq sound level than 39 dBA is measured then the project may exceed that level by 5 dBA. For design purposes, however, the limit is 44 dBA at non-participants.

3.0 Modeling Methodology

The new noise models of each phase have been created from scratch using the same Cadna/A[®] software and same assumptions as the original modeling work, but using the current site plans. A number of different turbine makes and models are still being considered for the project but for all intents and purposes these units have substantially similar sound power levels as reported by their respective manufacturers. For analysis purposes the Siemens SWT-2.5-120 has been assumed as a representative model, since its maximum sound power level of 107 dBA re 1 pW¹ at full power is as high or higher than all other potential candidates.

Because the sound levels from each phase were estimated to be most prominent relative to the background sound level during “critical” 5 and 6 m/s wind conditions, rather than at slightly higher wind speeds when the turbines would be operating at full power, the sound power level associated with 6 m/s operating conditions, for simplicity, has been taken as the design sound level for modeling and evaluation purposes for both phases. The average measured Leq sound level at night was found to be 38 dBA (in 5 m/s winds) during the Buckeye I field survey and 39 dBA (in 6 m/s winds) during the later Buckeye II survey, so the nominal project noise limits have been essentially set at 43 and 44 dBA, respectively, at nonparticipating residences per the OPSB’s permissible 5 dBA increase criterion. The turbine sound power level during 6 m/s wind conditions, per Siemens

¹ The units “dB re 1 pW”, or decibels with reference to 1 picoWatt, denote this quantity as a sound power level rather than a sound pressure level per standard industry practice.

Wind Power, and subsequently used in the modeling analysis is 105.5 dBA re 1 pW². The octave band spectrum associated with this operating condition, tabulated below, has been adapted from the maximum 8 m/s manufacturer values less 1.5 dB.

Table 3.3.2
Siemens SWT-2.5-120 Design Sound Power Level Spectrum for 6 m/s Wind
Conditions, 85.1 m Tower Height

Octave Band Center Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dBA
A-wtd Sound Power Level, dBA re 1 pW	87.3	93.3	96.7	99.6	100.6	97.5	92.5	85.0	105.5

The step up transformer in the collector substation has also been included in the model. The sound power level of the unit (98 dBA re 1 pW) has been calculated from the maximum MVA rating of 90.

4.0 Model Results

4.1 Buckeye I

The sound level contours associated with the current site layout are plotted out to the effective nighttime OPSB limit of 43 dBA relative to all non-participating residences in **Plot 1**. As with the 2010 model results, this graphic shows that all of the non-participating residences lie beyond the 43 dBA contour. Consequently, we would conclude that the current layout has not changed the expected noise impact from the project relative to the 2010 assessment and that the project will continue to comply with the noise conditions specified in the project permit.

4.2 Buckeye II

Plot 2 shows the sound contours associated with the up-to-date project layout projected out the permit limit of 44 dBA. This plot indicates that all non-participating residences will see an average project sound level that is below 44 dBA³ as specified in permit Condition (46).

² While the maximum sound power level of the turbine is 107 dBA re 1 pW at wind speeds of 7 m/s or higher, the background sound level is also higher, which would in turn increase the effective State limit. For example, during 7 m/s wind conditions the average nighttime Leq was measured at 41 dBA during the Buckeye II survey, which would put the project sound limit at 46 dBA – or 2 dBA higher - whereas the turbine's sound level is only 1.5 dB higher. Consequently, 6 m/s wind conditions are assumed as a worst-case in terms of audibility.

³ The three residences that appear just within the 44 dBA contour are located on land parcels where participation agreements are pending. It is assumed for the purposes of this analysis that these residences will likely become participants.

4.3 Combined Buckeye I and Buckeye II Projects

Although the overall project is divided into two phases they are intertwined and not geographically distinct, meaning that the sound emissions from one may have some effect on the other. In order to evaluate this aspect a third model plot was made that looks at the sound emissions from both phases/projects operating together relative to the permit condition for Buckeye II, which limits project noise to 44 dBA at non-participants. **Plot 3** shows that this condition will be satisfied; however, some units will need to operate in low noise mode to some extent to make this happen. “Low noise” mode assumes a 3 dBA reduction and “very low noise” mode represents a 5 dBA reduction relative to standard operation. These operating modes are also shown in the two previous plots where each phase was looked at individually, although in some cases, normal operation would be sufficient to meet each phase’s individual permit limit. Considering both phases together, the analysis indicates that 7 units will need to operate in low noise mode and 7 units in very low noise mode to generate the sound contours depicted in Plot 3. This situation is similar to what was found in the original modeling analysis for Buckeye II where about the same number of units needed to operate in low noise mode. Consequently, the current sound emissions situation is substantially similar to what it was at the time the projects were originally approved.

5.0 Conclusions

The sound emissions models for each phase of the Buckeye Wind Project have been updated to reflect the turbine eliminations that have occurred since Phase II of the project was last evaluated in 2012. The new modeling demonstrates that each phase of the project remains compliant with the permitted noise limits, which are predicated on an allowable increase of 5 dBA above the Leq background level measured under critical wind conditions. Because this design goal continues to be met in each individual case and in the combined scenario, the conclusions contained in our previous noise assessment studies remain valid.

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