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RESOURCE SYSTEMS GROUP, INC.

Environment, Energy & Acoustics

Post-construction Sound Monitoring Protocol

Georgia Mountain Community Wind

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Submitted by
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For

Georgia Mountain Community Wind

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1. INTRODUCTION

The Certificate of Pubic Good (CPG) for Georgia Mountain Community Wind (GMCW) issued by the Vermont Public Service Board (PSB) on June 11, 2010, specifies the following requirements regarding noise:

23. GMCW shall construct and operate the Project so that it emits no prominent discrete tones pursuant to American National Standards Institute (ANSI) standards at the receptor locations; and Project- related sound levels at any existing surrounding residences do not exceed 45 dBA(exterior)(Leq)(1 hr) or 30 dBA (interior bedrooms)(Leq)(1 hr).
24. In the event noise from operation of the Project exceeds the maximum allowable levels, the Petitioner shall take all remedial steps necessary to bring the sound levels produced by the turbine(s) into compliance with allowable levels, including modification or cessation of turbine(s) operation.
25. GMCW shall submit, for Board approval, a noise monitoring plan to be implemented during tile first full year of operation. The plan shall establish a monitoring program to confirm under a variety of seasonal and climatic conditions compliance with the maximum allowable sound levels described above. Parties will have three weeks, from the date this plan is filed with the Board, to comment on the plan. GMCW cannot commence operations until the plan is approved.

Subesequently, on October 31, 2012, the PSB clarified Condition 25 to require the Plan to describe how noise complaints and noise violations are handled.

This document represents the sound monitoring protocol and compliance plan to meet the requirements of Condition 25 under the CPG and the subsequent Order.

2. SOUND MONITORING PROTOCOL

This goal of this first year monitoring protocol is to determine whether the sound levels generated by the GMCW wind farm exceed the standards set in the CPG.

The protocol is enumerated as follows:

1) The monitoring will take place over at least ten days, in each of the summer, winter, spring, and fall during the first full year of operation.
2) Monitors will be set up at each of the three stations that background data were collected previously (see Figure 1). If those stations are not available or better-suited locations become available, representative alternatives will be selected. During the first year, up to three additional locations may be selected if noise complaints are received and those complainants are not located in areas represented by the three primary monitors.
    a. Sound level meters meeting the accuracy requirements of ANSI/IEC Type 1 or Type 2 will be used.

b. Microphones will be placed outside at approximately 1.5 meters above ground and fitted with 7 inch waterproof windscreens. Microphones will not be placed such that any structure blocks the line of sight between the microphone and wind farm (if otherwise visible). Every effort shall be made to ensure that locations selected are representative of the noise exposure at subject homes.

c. Selected locations will be at least 7 meters from reflective surfaces such as buildings.

d. Anemometers will be set up at each location at microphone height.

e. Monitors will be set to record at 1-second time intervals over the entire period.

f. 1/3 octave band Leq will be recorded during each 1-second interval.

g. Sound level meters will be field calibrated before and after measurements, and calibration drift will be noted.

h. Temperature and rainfall will either be measured on site, or Burlington airport will be used as a proxy.

3) Wind speed and wind direction will be recorded for each 10-minute period, as measured at each turbine hub.

4) Power output at each turbine will be measured at 10-minute intervals, and will be converted to wind speed based on the power curve.

5) The wind farm will be shut down for 30 minutes on six occasions during the monitoring period. The periods will be selected during the night to cover a variety of meteorological conditions. In each case, however, the sound power of the turbines will be within 1 dB of its maximum. This 30-minute period will be representative of background noise.

6) The one-hour period before and after the turbine curtailment will be the "turbine plus background" sound level.

7) The resulting data will be analyzed as follows:

   a. The outside to inside transmission loss is assumed to be 15 dB in accordance with the WHO Guidelines for Community Noise.

   b. For nighttime periods which exceed 45 dBA outside, background levels from the turbine shut-off times will be subtracted. The turbine sound level will be determined by logarithmically subtracting the background sound level obtained when the turbines were not operating. Note that for this subtraction to be accurate, the turbine plus background sound levels must be at least 3 dB above the background sound level.

   c. For both background and turbine monitoring periods, data that is contaminated by human activity, winds greater than the wind screen specification, temperatures outside of the sound level meter specification, and rain will be removed from the data set. These periods can be determined by using appropriate sound recordings, spectrogram analysis, and meteorological instrumentation, as the case may be. In addition, insect, bird, and leave rustling noise may further be eliminated by filtering the data using an "Ai" weighting, eliminating sound from frequencies above 1,250

Hz. (consistent with that described in "Proposed 'Ai'-weighting; A weighting to remove insect noise from A-weighted field measurements", Paul D. Schomer, Ian M. Slauch, and George F. Hessler, InterNoise Proceedings, Volume 221, pp. 3991-4000 (2010).)

d. If the resulting sound level exceeds 45 dBA outside/30 dBA inside,[1] recordings of the sound and other data will be used to determine whether the wind turbine contributed to the sound.

e. If the resulting hourly Leq exceeds 45 dBA/30 dBA inside, then these periods and levels will be highlighted.

f. 1/3 octave band data will be evaluated to identify periods with pure tone.

8) A report will be prepared that shows:

a. Locations of all sound monitors and distance to the nearest turbine.

b. A summary of all data collected, including sound levels, meteorological data at the monitoring stations, and turbine operating conditions.[2]

c. Times of potential exceedaences of the outdoor, indoor, or tonal standard, and the results of investigations into those exceedaences.

d. Conclusions

e. An appendix containing 10-minute data for each turbine including wind speed, and power output

9) Raw data will be made available upon request. However, sound recordings will only be made available if they do not contain human speech or other human activities where there may be concerns over privacy.

10) Some portions of the report may have confidential information, in which case distribution would be limited by an appropriate protective agreement.

3. COMPLAINT RESOLUTION

The following complaint resolution procedure will assure that concerns by neighbors regarding wind turbine noise are addressed in a timely manner while, at the same time, preventing abuse of the complaint process. The complaint resolution procedure shall be as follows:

1) The complaint process shall be in place for the life of the Project.

2) A complaint phone number and contact person shall be provided to the Town Clerks and Selectboards of Milton and Georgia.

[1] Sound levels will not be rounded. For example, a background-adjusted measured value of 45.1 dBA will be considered to exceed the standard of 45 dBA.

[2] All available turbine operating parameters will be made available upon request. Some of these data may be confidential and will be released under an appropriate protective agreement.

3) GMCW will provide an initial acknowledgement to complaints within 1 to 2 business days.
4) Complainants will be requested to provide GMCW with the following information related to the complaint
    a. Location of the observed sound
    b. Time and date the sound occurred
    c. Weather conditions (snow cover, cloud cover, wind direction and relative speed, etc)
    d. Description of the sound.
5) GMCW shall record the complainant information, and weather, turbine operating status, and power output during the time of the complaint.
6) GMCW will investigate as described below if the complaint represents a permanent residence within 1.5 km (0.9 miles) of the turbine string, and, based on monitoring and/or modeling, there appears a reasonable possibility that the Project sound level is within 5 dBA of the CPG exterior noise limit at the complaint location, and not related to abnormal Project operation or maintenance.
    a. The A-weighted sound level from the closest monitoring location shall be extrapolated to the complaint location by means of the following formula to determine whether the sound level there is likely to be within 5 dBA of the exterior sound limit:

        Lpc = Lpm + 20 log (Dm/Dc), in dBA

        Where

        Lpc = Estimated sound level at the complainant location

        Lpm = Sound pressure level determined at the nearest monitoring location

        Dm = Distance from the turbine string to the relevant monitoring location

        Dc = Distance from the turbine string to the complainant location
    b. If the extrapolated sound level is not within 5 dB of the exterior sound limit, then the wind farm operator will respond to the complainant, but is not required to conduct additional sound testing. Similarly, if the complaint is a result of abnormal operation, the operator will respond to the complainant and make necessary repairs, but will not be required to conduct sound testing
    c. If, on the other hand, the sound level is within 5 dB of the exterior sound limit, then GMCW will offer the homeowner testing to determine the attenuation value of the affected structure. If the offer is accepted, testing will be conducted using the ASTM E966-10 standard, 10, *Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Façade Elements (2010)*. If no such request is made, a 15 dB value will be used.
7) Sound monitoring will be conducted if (a) the sound level is within 5 dB of the exterior sound limit (based on the initial screening described above) and the attenuation value of

the structure (based on the outside-to-inside test) does not exceed 12 dB, or (b) the sound level is within 3 dB of the exterior sound limit (based on the initial screening described above).

8) Sound monitoring will not be repeated in a representative area during any five year period unless operational or maintenance changes result in an reasonable assumption of higher turbine sound levels. Nothing in this paragragh removes the ability for a party to petition the PSB for additional testing nor does it exclude the PSB from requiring additional testing during this period to address extenuating circumstances.

9) Complainants may be asked to log sound events over a period of time to help identify influences that affect the sound. If the factors identified above demonstrate that follow-up sound monitoring is warranted, monitors will be set up by a noise control engineer no later than four weeks after the complaint. GMCW shall make all reasonable efforts to conduct such monitoring under conditions similar to those existing at the time the complaint arose.

10) If the complaint occurs within the first year of operation (or during any additional Board-ordered monitoring period), the monitoring will conform to the above criteria; otherwise it will be based on methods that will be developed in response to the type of complaint issued. The methods to be used will be developed based on information gained during the first year of operation and the entire monitoring database, and will be filed for review by the complainant and PSB. A resident may request that the Board, by order, require an additional round of monitoring at any time, and the request shall include an explanation of why the resident believes additional monitoring is needed. If the methodology described in Section 2.6(5) is used, the condition which corresponds to the operational status during the complaint should be accounted for.

11) Because of the complexity of complaint resolution, full cooperation of the complainant and the adherence to the above test procedures is necessary.

12) GMCW shall develop a protocol for informing a resident when it intends to conduct any exterior sound monitoring and work with the resident to determine an appropriate location for the monitoring equipment. GMCW will also provide information on turbine functionality during the monitoring period when it provides the results of the monitoring to the resident.

13) The official results of the monitoring shall be contained in a report that is submitted to the complainant, the Department of Public Service and the PSB. This report will contain specific information collected during the complaint monitoring, including wind speed and direction, operational status of the turbines, sound levels, and the raw sound level data collected by the noise control engineer conducting the tests.

14) If it is found that the project sound level at any permanent residence is above the allowable limit, GMCW shall take all remedial steps necessary to bring the sound levels produced by the turbine(s) into compliance with allowable levels, as required by the CPG

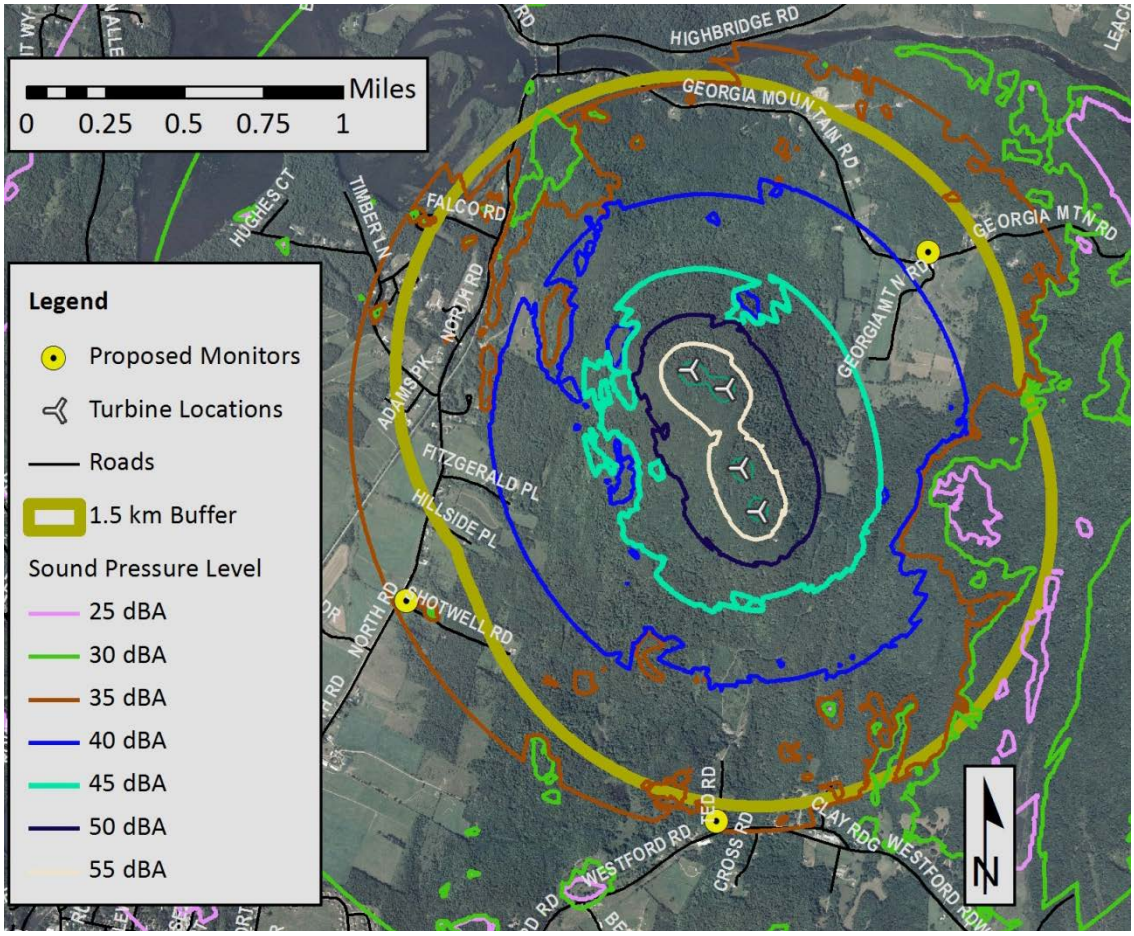

Figure 1: Monitoring locations from the pre-construction sound monitoring that are proposed to be monitored during post-construction and 1.5 km (0.9 mile) buffer from the trubines