

**STATE OF VERMONT
PUBLIC SERVICE BOARD**

Docket No. _____

Petition of UPC Vermont Wind, LLC for a Certificate of)
Public Good pursuant to 30 V.S.A. section 248,)
authorizing it to construct up to a 52 MW wind electric)
generation facility, and associated transmission and)
interconnection facilities, in Sheffield and Sutton, Vermont,)
and operate the same.)

**PREFILED DIRECT TESTIMONY OF
CHRISTOPHER J. BAJDEK**

ON BEHALF OF UPC VERMONT WIND, LLC

February 21, 2006

Summary:

Mr. Bajdek's testimony describes the study conducted by HMMH regarding the potential noise impacts of the proposed Sheffield Wind Farm. The results of the study demonstrate that the project will produce relatively low sound levels at the closest residences, and will not have an undue adverse effect on public health or on aesthetics.

1 **Q. Please state your name and occupation.**

2 Response. My name is Christopher J. Bajdek. I am Senior Consultant at Harris
3 Miller Miller & Hanson Inc., 77 South Bedford Street, Burlington, MA 01803
4 (HMMH).

5
6 **Q. Please describe your qualifications and experience.**

7 Response. I have 15 years of experience as a consultant in noise and vibration
8 control, managing numerous transportation, industrial and community projects,
9 including noise studies for wind energy facilities. My experience includes noise
10 measurement programs to evaluate compliance with local regulations for two wind
11 energy projects in Wisconsin. My responsibilities encompass a wide variety of issues
12 from initial measurement programs and environmental documents through complex
13 noise barrier final-design studies and public involvement. I also have recent
14 experience acting as HMMH's Assistant Project Manager for the noise analysis for
15 the Philadelphia International Airport (PHL) Runway 17-35 Extension Project EIS,
16 for which the Record of Decision was issued in April 2005. I am familiar with
17 various noise prediction models such as the Federal Aviation Administration's
18 (FAA's) Integrated Noise Model (INM), and the international noise prediction
19 model SoundPlan, and I am proficient in the use of the Federal Highway
20 Administration's (FHWA's) Traffic Noise Model (FHWA-TNM®).

21 I received a B.S. in Mechanical Engineering, Northeastern University, Magna
22 Cum Laude, 1990, and attended the Penn State Summer Program in Acoustics, June
23 2003. I am a member of the Institute of Noise Control Engineering of the USA

1 (INCE/USA) and the Greater Boston Chapter of the Acoustical Society of America.
2 I recently attended the First International Conference on Wind Turbine Noise Wind
3 which was sponsored by INCE/Europe.

4 A copy of my resume is attached as *Exhibit UPC-CB-1*.

5
6 **Q. Have you previously testified before the Public Service Board or in other**
7 **judicial or administrative proceedings?**

8 Response. I have no prior experience giving testimony before an agency as an expert
9 witness. Note that I was deposed just one time – as a witness to the facts for a case
10 in Massachusetts in 1999. Before that, I assisted Chris Menge of HMMH with the
11 preparation of materials for a case related to a noise study for a landfill in upstate
12 New York.

13
14 **Q. What is the purpose of your testimony?**

15 Response. My testimony describes the study conducted by HMMH regarding the
16 potential noise impacts of the proposed Sheffield Wind Farm. The results of the
17 study demonstrate that the Project will produce relatively low sound levels at the
18 closest residences, and will not have an undue adverse effect on public health or on
19 aesthetics. A copy of our report is attached as *Exhibit UPC-CB-2*.

20
21 **Q. Please summarize the investigations you conducted regarding the project.**

22 Response. To evaluate the effect of noise on nearby land uses, HMMH conducted a
23 multi-step noise study. First, HMMH conducted background measurements for a

1 period of 45 hours at four locations around the site of the proposed wind farm
2 between the dates of October 26, 2005 and October 28, 2005. The four
3 measurement locations are identified as M1, M2, M3 and M4 on the map labeled
4 Figure 8 of our report (and on the map attached as *Exhibit UPC-CB-3*). The four
5 sites were chosen based upon consideration of noise-sensitive land use in the study
6 area, other sources of noise that are representative of the study area, and a balanced
7 geographic distribution. Average day-night sound levels ranged from 39 dBA at the
8 quietest monitoring location on Hardscrabble Mountain Road to 63 dBA at the site
9 with the highest measured background levels on New Duck Pond Road.

10 Second, we obtained manufacturer's data regarding the sound levels
11 produced by the wind turbines that may be used at the Project. The reference sound
12 power levels are presented in Figure 7 and Table 3 of the noise study report. These
13 sound power levels were used as inputs to the SoundPLAN[®] computer model, which
14 takes into account a number of factors and conditions to estimate project-generated
15 noise at surrounding areas. An industry standard, SoundPLAN was developed by
16 Braunstein + Berndt GmbH to provide an estimate of sound levels at distances from
17 specific noise sources. Noise Levels were calculated for 45 locations in the vicinity
18 of the wind farm, including residential areas, nearby schools, and farms. The
19 computed maximum A-weighted noise levels are presented in Table 6 of the Noise
20 Study Report. We used international standards that represent worst-case conditions
21 for sound propagation and assumed continuous operation of the wind farm during
22 the period being modeled (a conservative assumption). Finally, we evaluated the
23 modeled project noise against guidelines established by the United States

1 Environmental Protection Agency for protection of human health and welfare with
2 an adequate margin of safety.

3

4 **Q. What other sources of background noise exist at or near the project, and what**
5 **effect do they have?**

6 Response. During the measurement program, HMMH personnel observed a
7 number of noise sources that contributed to the acoustic environment. Such sources
8 included wind in the trees, occasional traffic on local two-lane roads, heavy
9 equipment at Site M-4, a diesel tractor and tree-cutting equipment, heavy truck traffic
10 along South Barton Road, and wildlife such as birds. These sounds were found to be
11 typical of the existing noise environment and will at times mask the noise levels from
12 the wind farm.

13

14 **Q. What noise standard did you use in your analysis?**

15 Response. Neither Sheffield nor Sutton has a quantitative community noise
16 standard, and there are no state regulatory standards that apply to this project.
17 Consequently, this study compares the modeled wind farm noise with guidelines
18 established by the United States Environmental Protection Agency (EPA). Those
19 guidelines were chosen because they protect against adverse health effects from
20 environmental noise. The EPA identified levels of noise below which there is no
21 reason to suspect that the general population will be at risk of the stated health
22 effects. The EPA guidelines are presented in Table 2 of our report, and are
23 summarized as follows:

- 1 • Exterior level of 55 dBA Ldn to protect against outdoor activity
- 2 interference and annoyance.
- 3 • Interior level of 45 dBA Ldn to protect against indoor activity
- 4 interference and annoyance.

5 In June 2005, the Bureau of Land Management (BLM) of the U.S.
6 Department of the Interior prepared an Environmental Impact Statement (EIS) to
7 address the impacts of wind energy facilities located on BLM lands. In siting wind
8 energy facilities in jurisdictions that do not have applicable noise standards, the BLM
9 made use of the EPA's guideline values to assess the effects of noise.

10

11 **Q. Based on your analysis, what are the forecasted sound levels for the closest**
12 **homes?**

13 Response. There are roughly a dozen locations at which the wind farm will be
14 audible. In these locations to the east and south of Hardscrabble Mountain,
15 maximum noise levels from full operation of the wind farm will be no greater than
16 38 dBA. Our computations show that 8 residences would experience exterior levels
17 between 35 and 38 dBA. The exterior day-night noise level due to wind farm
18 operations would be 45 dBA at the closest residences to the east of Hardscrabble
19 Mountain, under downwind conditions and full operation of the wind farm. For
20 comparison purposes, these maximum levels are less than the sound levels from
21 common, every-day sources such as ordinary human speech, or the hum of a
22 refrigerator. The day-night noise levels produced by the wind farm at the closest
23 homes are similar to average sound levels in rural and wilderness areas. Wind farm

1 noise levels are depicted on Table 6 of our report and on the Noise Contour Map,
2 ***Exhibit UPC-CB-3.***

3
4 **Q. How would you describe the turbine-related noise, qualitatively?**

5 Response. The character of the sound from the wind farm is generally consistent
6 with background levels and somewhat like wind in the trees. The sound generated
7 by the wind farm is broadband in nature in that it has a consistent quality and does
8 not exhibit sharp spikes or rapid oscillation of sound more characteristic of
9 hammering or a helicopter. Furthermore, the sounds from this wind farm will
10 exhibit a consistent sound level for varying wind speeds. In other words, the sound
11 level generated at 7 m/s will be relatively the same as that generated at 30 m/s.
12 Conversely, as wind speed increases the sound from the passage of air through the
13 trees (“wind in the trees”) increases proportionately. This phenomenon will produce
14 a masking effect of the wind farm noise. After a certain wind speed, the noise created
15 by the wind through the trees will mask the noise produced by the turbines.
16 Therefore, there may be times when the sound from the wind farm will be audible
17 (although still below the EPA’s guideline values) at those homes that are closest to
18 the wind farm – at homes along Berry Hill Road and Hardscrabble Mountain Road
19 in Sheffield. However, due to the masking effect, the wind farm will be mostly
20 inaudible at many of the other locations we evaluated.

21

1 **Q. How do these sound levels compare with existing background levels and**
2 **other common activities?**

3 Response. These overall levels are relatively low when compared to other sources of
4 noise in the built and natural environment. For comparison purposes, maximum
5 levels from the wind farm are less than the sound levels from common, every-day
6 sources such as ordinary human speech which is roughly 60 to 65 dBA at a distance
7 of 3 feet, or the hum of a refrigerator which is in the 40s dBA. The Day-Night
8 Noise Levels (DNLs) produced by the wind farm at the closest homes are similar to
9 average sound levels in rural and wilderness areas. For example, a DNL of 45 dBA is
10 typical of background sound levels in a rural setting, and a DNL of 35 dBA is typical
11 of a wilderness setting. Recall that measured DNLs ranged from 39 to 63 dBA at the
12 measurement sites.

13

14 **Q. How do these levels compare with the EPA standards?**

15 Response. The worst-case daily exposure from the project is well below the
16 guideline daily exposure set by the EPA, for both interior and exterior noise. Since
17 we did not consider the masking effect of trees, and the model always assumes a
18 down-wind condition with the wind farm operating continuously, we anticipate that
19 under actual operating conditions noise from the wind farm would be even less
20 intrusive. At the closest homes, the exterior Day-Night Noise Level from the wind
21 farm would be 45 dBA, while the EPA's exterior guideline is 55 dBA to protect
22 against outdoor activity interference and annoyance. The interior DNL from the

1 wind farm at the closest homes would be 35 dBA, while the EPA's interior guideline
2 value is 45 dBA.

3

4 **Q. Will the project create undue adverse impacts on noise aesthetics in the**
5 **vicinity of the Project?**

6 Response. No. The sound levels which will be generated as a result of the project
7 will be well below commonly accepted noise standards and thus will not create an
8 undue adverse impact on noise aesthetics in the community.

9

10 **Q. Will other operational equipment cause noise impacts?**

11 Response. HMMH did not specifically model noise from the substation or above-
12 ground collector lines. However, given the distance of roughly 1/2 mile from the
13 substation to the closest receptors, and the typical noise levels associated with a
14 substation and electrical lines of the size being contemplated, I would not anticipate
15 that these sources would have any appreciable effect on existing background sound
16 levels.

17

18 **Q. Did you consider the noise related to construction activities?**

19 Response. Yes. Generally, most construction activity will occur for the most part
20 during normal working hours on weekdays when higher sound levels are typically
21 present, and are found acceptable. If mitigating efforts are taken, this temporary
22 source of noise (which I understand will be one construction season) should not
23 result in an undue adverse impact.

1

2 **Q. What mitigating steps could be taken to reduce any negative impact during**
3 **construction?**

4 Response. In our report, we discuss several mitigating steps, including equipping any
5 internal combustion engine used for any purpose on the job or related to the job
6 with a properly operating muffler; conducting truck loading, unloading and hauling
7 so that noise is kept to a minimum; routing construction equipment and vehicles in
8 areas that will cause the least disturbance to nearby receptors, where possible; and
9 placing continuously operated diesel-powered equipment, such as compressors and
10 generators, in areas as far as possible from or shielded from noise-sensitive locations.

11

12 **Q. Does that conclude your testimony at this time?**

13 Response. Yes.