STATE OF VERMONT
PUBLIC SERVICE BOARD

Joint Petition of Green Mountain Power Corporation, Vermont Electric Cooperative, Inc., Vermont Electric Power Company, Inc., and Vermont Transco LLC, for a Certificate of Public Good, pursuant to 30 V.S.A. Section 248, for authority to construct up to a 63 MW wind electric generation facility and associated facilities on Lowell Mountain in Lowell, Vermont, and the installation or upgrade of approximately 16.9 miles of transmission line and associated substations in Lowell, Westfield and Jay, Vermont.	)	March 21, 2011 Docket No. 7628

PROPOSED FINDINGS OF FACT AND BRIEF OF THE TOWNS OF CRAFTSBURY AND ALBANY, VERMONT

NOW COME the Towns of Craftsbury and Albany, Vermont, by and through their attorney, Jared M. Margolis, and hereby provide the following Proposed Findings of fact and Brief in the above-captioned matter.

I. INTRODUCTION

Green Mountain Power ("GMP") proposes to construct up to 21 wind turbines on the Lowell Mountains in Lowell, Vermont (the "Project"). The Public Service Board ("Board") must decide whether the Project complies with the statutory criteria set forth in 30 V.S.A. § 248, and ensure that the Project will be in the public good.

The towns of Craftsbury and Albany (the "Towns") have intervened in this matter to protect the interests of the municipalities' residents living in the vicinity of the proposed Project. Even though both Albany and Craftsbury had some initial concerns, the Towns approached this Project with an open mind, waiting to see all of the evidence and hear from the experts before

taking a position on the Project. As is set forth in the attached letters from the Towns and the arguments made herein, after reviewing the evidence, attending the hearings and taking into account all of the evidence, both Craftsbury and Albany believe that this Project is not in the public good.

The Towns have several concerns regarding GMP's proposed Project, including the aesthetic impacts and related economic impacts on property values and tourism, the impacts to the natural communities in the area, and the potential for noise from the turbines to pose a public health risk. Many aspects of these matters remain unresolved, and as GMP has failed to adequately address these concerns, they therefore have not met their burden to provide adequate information on which the Board can make positive findings.

Moreover, the Towns are very concerned that the Project will result in noise levels that will pose an undue adverse impact on the area – both in terms of aesthetics and public health. The standard that the Board has used in prior cases is insufficient to protect public health, and will expose nearby residents to noise levels that can cause annoyance, sleep disturbance and an array of related health problems. Furthermore, even if the Board decides, against all the evidence to the contrary, to use the same 45dBA (exterior) standard, the modeling performed by GMP's expert is unreliable, and did not take into account the standard deviations inherent in the models, thereby underestimating the potential noise that will be experienced. GMP is also relying on attenuation by the homes to maintain the 30dBA interior standard (necessary to protect public health), based on nothing more than speculation, and which may not apply for older homes or when windows are wide open. This Board cannot allow the Project to go forward where it would pose such risks to the public health.

In GMP's initial testimony, Mary Powell stated that this Project is "not for the faint of heart, but lowering our carbon emissions and meeting customer expectations is worth it." Albany and Craftsbury submit that it is not worth it when the Project poses an undue adverse risk to public health, and the Project will have an undue adverse effect on aesthetics, which will affect tourism in the area and will harm the value of as many as 120 homes with no compensation. GMP relies on broad statements of renewable energy goals, and expert testimony that is in many cases biased and incomplete. They have not met their burden to show that this Project, on this site, meets the requirements of 30 V.S.A. § 248, and therefore a CPG cannot be issued by the Board.

II. THE PROPOSED PROJECT WILL PRODUCE NOISE THAT WILL POSE UNDUE ADVERSE PUBLIC HEALTH AND AESTHETIC IMPACTS TO THE COMMUNITY.

A. Noise from wind turbines has the potential to cause undue adverse health impacts, and the noise standard the Board has used in prior cases is not adequate to protect public health.

Findings:

1. The Board has used a standard of 45dBA averaged over an hour (exterior) and 30dBA (interior) in prior cases regarding wind Projects. This standard is not sufficiently protective of public health, and will expose members of the public to noise levels that may have an undue adverse impact on health through annoyance and sleep disturbance.

2. There is well accepted evidence in the medical literature that shows noise can cause adverse health effects on people, including hypertension, heart disease, hormonal stress reactions, and sleep disturbance, as well as many other problems. Lovko, Nov. 22 pf. at 3. McCunney, Feb. 10 at 56-7.

3. The WHO guidelines are not specific to wind turbine noise. Irwin, Feb. 24 at 51. The studies they refer to are based on road noise, air traffic, and community noise. Lower sound level limits will need to be provided for noise sources with high levels of low frequency sounds (such as wind turbines) as these sources are more likely to create health problems. Lower sound limits will also be required when sounds are not continuous (i.e. fluctuate like wind turbine noise) and in areas where background sound levels are low (such as rural areas like Lowell/Albany). Lovko, Nov. 22 pf. at 3; James, Nov. 22 pf. at 3; Blomberg, Oct. 22 pf.

at 4-5, 11.

4. Amplitude modulation, described by Dr. McCunney as the swish-swish effect, distinguishes wind turbine noise from other types of noises such as transportation noise. McCunney, Feb. 10 at 58. "I don't think swish swish noises occur in transportation." *Id*. at 80.

5. Studies from the Netherlands showed wind turbine noise to be "more annoying than transportation noise or industrial noise at comparable levels, possibly due to specific sound properties such as a 'swishing' quality, temporal variability and lack of nighttime abatement." This unique combination of features makes it plausible that wind turbines might have adverse health effects more frequently and at lower sound levels than the noise sources cited in the WHO 2009 report. Lovko, Nov. 22 pf. at 3-4; James, Oct. 22 at 16.

6. "There's no question there are people who are troubled by the noise levels associated with wind turbines." McCunney, Feb. 10 at 63.

7. Wind turbine sound has a number of attributes which make it different than other commonly studied noise sources. Wind turbines emit large amounts of low frequency and infrasound that travels farther than higher sound frequencies and which is poorly attenuated by walls and windows and is capable of causing noise related to the vibration of these structures. Wind turbine sound often shows amplitude modulation, a pulsatile nature to the sound that has been shown to be more annoying than steady noise. Wind turbines will often be as loud, or louder, at night than they are during the day. Wind turbines can be a source of continuous fluctuating sound for long periods of time depending on wind conditions. Lovko, Nov. 22 pf. at 3-4; James, Oct. 22 pf. at 16.

8. The best available studies on wind turbines show that the levels of self reported annoyance and sleep disturbance start to rise at about 35dB as measured outside the building. Lovko, Nov. 22 pf. at 6.

9. The WHO findings suggest that even a 35dBA limit may result in annoyance and sleep disturbance. *Id.* at 4.

10. The VDH report provided by Dr. Irwin states that "Sleep disturbance may occur at sound levels from wind turbine facilities as low as 35 to 40 dB." DPS-WEI-2 at 5.

11. Averaging sound levels over a long period of time would allow sound levels to rise high enough to cause health problems and sleep disruption, while still being in compliance as long as there were periods of low sound levels to average out these higher peaks. Lovko, Nov. 22 pf. at 5; James, Nov. 22 pf. at 4.

12. It does not take prolonged noise elevation to disrupt sleep and these brief peaks of noise have the potential to disrupt sleep many times during a night. Lovko, Nov. 22 pf. at 5.

13. Given that sleep research suggests arousals can start to occur at sound levels around 35dBA (Hanning 2010) and current studies show a marked rise in annoyance and sleep disturbance at sound levels greater than 35dBA, 35 dB exterior or below is likely to be protective of public health. *Id.* at 7. 45 dBA is too high and will not protect people from the health effects and sleep disturbance they will experience at these sound levels. *Id.* at 10.

14. There can be indirect health impacts from turbine levels below 45 decibels including sleep disturbance or deprivation, annoyance, and stress. McCunney, Feb. 10 at 40-41. Health effects associated with sleep disturbance may be experienced at noise levels under 45 decibels. *Id.* at 41. These may cause an adverse effect on people's health and well being. *Id*. Sleep deprivation can increase risks of high blood pressure, myocardial infarction. *Id*. at 56.

15. Dr. McCunney's statement that there are no direct health effects from noise below 45dBA ignores the indirect health effects of noise through sleep annoyance and sleep disturbance, and his approach goes against the view of numerous regulatory agencies, acoustic experts and experts in the medical field who consider annoyance and sleep disturbance as problems in and of themselves as well as being mediators leading to other health problems such as cardiovascular disease, depression, decreased health related quality of life. Lovko, Jan. 10 pf. at 5-7.

16. Current views on noise and health suggest that annoyance and sleep disturbance, and the hormonal reactions that accompany them (increased autonomic activity, increased cortisol levels), contribute to other health effects such as hypertension, cardiovascular disease, depression, migraines, decreased quality of life, arthritis and respiratory problems. *Id*. at 7.

17. Q: "So you would agree with me if it was shown that there can be negative impacts, can be annoyance, at or below 45 decibels, then the standard should be below 45 decibels?"
A. "Yeah, according to what I've said is my belief. Yes." Kane, Feb. 9 at 72.

18. There have been three major studies looking at more than 1,500 people examining this issue. These studies provide clear and consistent evidence that the sound standard proposed by GMP and standards previously used by the Public Service Board are too loud to be protective of public health from wind turbine noise. Taken together, these studies show that adverse health effects, primarily annoyance, begin to consistently increase at levels above 35 dBA. The prior standard used by the Public Service Board, and the standard requested by GMP, allow for 45dBA, which will not be protective to many people exposed to levels higher than 35 dBA. Lovko, Jan. 10 pf. at 2-4.

19. The most critical factor to address is to establish a standard protective of human health and that avoids undue adverse impacts as a result of annoyance. DPS-MK-2 at 22.

20. WHO's report concludes that limiting sound exposure at night to reduce the probability of sleep disturbance minimizes the adverse health and quality of life effects on the exposed population. Irwin, Feb. 24 at 74.

21. The goal of a health standard should not be at the brink of the risk. A bridge is not constructed so that it might fall down; similarly, a turbine Project should not be designed or permitted where it is at the brink of causing adverse health effects. There should be a safety factor. James, Feb. 23 at 43-44.

22. "At a given L_{night} value, the most unfavorable situation in terms of a particular biological effect of night-time noise is not, as might be supposed, one characterized by a few loud noise events per night. Rather, the worst scenario involves a number of noise events all of which are roughly 5 dBA above the threshold for the effect in question." ALB-RJ-6 at 83.

23. Q: "How close would you feel comfortable having a wind turbine cited near your home?"
A: "… I think the answer would be based on the sound level… but to try to answer the question directly I think, you know, keep it below 35 decibels; something along those lines; maybe 40. I'll have to be honest with you I don't know."
Dr. McCunney, ALB-Cross-7 at 37-38.

Discussion:

There is well accepted evidence in the medical literature that shows wind turbine noise can cause adverse health effects on people. *See* prefiled testimony of Dr. Lovko and ALB-RJ-4. If noise levels are too high, the noise can cause annoyance and sleep disturbance, which are adverse health effects in their own right, but which also can lead to cardiovascular illness, depression, elevated heart rates, changes in stress hormones, impaired glucose tolerance, increased use of prescription medications (for sleep, depression, hypertension), depression, hypertension, weight gain, headaches, tinnitus, decreased attention, accidents, and decreased work/school performance. Lovko, Nov. 22 pf. at 3, 9, 11.

One of the fallacies put forth by GMP in these proceedings is that wind turbine noise can be compared to the noise one experiences in a library, or is nothing more that the noise emitted by an HVAC – even suggesting that it is no more, in terms of dBA, than a low conversation. *See e.g.* Feb. 22 at 50-51, 265. This fails to take into account an aspect of wind turbine noise that makes it different than most other noises, known as amplitude modulation – described by Dr. McCunney as the swish-swish effect – which has been shown to cause annoyance from wind

turbines at noise levels significantly lower than transportation noise, on which many of the studies and standards, including the WHO standards, relied on by GMP are based.[1]

This amplitude modulation can cause the noise to increase by as much as 5-10dBA in one second intervals as the blades slice through the air. James, Jan. 24 pf. at 6-7. Moreover, the phenomenon that causes this amplitude modulation occurs mostly at night, when stable atmospheres create conditions wherein there are low wind speeds at lower altitudes, and increasing wind speeds up through the atmosphere. *Id*. These wind shear events, as they are called, make it impossible for the turbines to set the blades at a maximum angle for efficiency. Since the blades all must be at the same angle due to limitations in turbine design, and since the turbines have only one anemometer, they do not have the ability to adjust to the very different wind speeds that occur at the top and bottom of the rotation of the 350 foot diameter blades. Depending on the angle of attack, and how many degrees by which it is off of optimum, the noise can be increased by several dBA, and it is the modulation of this increase – the rhythmic increase in noise causing the wooshing or swishing effect – that poses the problem with comparing wind turbine noise to other noise sources. ALB-RJ-6 at 141, App. B-5.

What this means is that even if the turbine noise can be considered to be nothing more, in terms of sound pressure levels, than a person talking, it would be as if someone were in your bedroom at night, standing next to your bed saying "swish-swish-swish-swish- swish-swish" for random periods of time throughout the night. This is not the steady white-noise than can help people sleep, but rather has been shown to be an annoyance that causes sleep disturbance at

[1] Dr. McCunney stated, "The major cause of concern from [wind turbine] noise at least based on our review of the literature, and mine in particular, is the fluctuating nature of it. The noise may be more perceptible at night than daytime when people have no other competing sources of noise, but there's no question people do report that." ALB-Cross-7 at 28.

levels of 40dBA and lower, which even Dr. McCunney agreed with. ALB-Cross-7 at 57. It would be as if you were indeed in a library, but the librarian could not stop shushing the patrons, skipping like a stuck record and constantly going "*shush-shush-shush*" as you tried to study. Perhaps Board member Burke might have had trouble sleeping in the library at college had the librarian behaved like that,[2] and perhaps that librarian would not be welcome in the library for causing a disturbance – even with only a repeated "*shush*" of no more than 40-45dBA.

The WHO reports, on which several experts rely, even state that the noise standard WHO recommends, which is based on transportation noise with noise from wind turbines not discussed anywhere in the 1999 or 2009 WHO reports, must be reevaluated for noises that have this amplitude modulation, since they can cause disturbance and adverse health impacts at lower levels than consistent noises. Lovko, Nov. 22 pf. at 3. Indeed the literature on this topic shows annoyance (an adverse health effect in its own right according to the WHO 2009 Report) and sleep disturbance occurs from wind turbines at lower sound levels than for most other noise sources. Two studies done in Sweden show levels of annoyance and sleep disturbance starting to rise at or below 35dB, with 28% showing annoyance at sound levels of 37.5-40dBA and continuing to rise as sound levels increase above 40dB (all exterior). Lovko, Nov. 22 pf. at 4. These studies show that almost 50% of people reported annoyance at sound levels greater than 40dBA and in one of the studies 64% of those suffering annoyance also reported sleep disturbance. *Id.* Pedersen and Waye (2004) reported that "16% (n=20, 95%CI: 11%–20%) of the 128 respondents living at sound exposure above 35.0 dBA stated that they were disturbed in their sleep by wind turbine noise." ALB-RJ-4 at 8. A more recent study by Pedersen et al

[2] *See* Mr. Burke, Feb. 22 at 265 ("I was always able to sleep pretty well in a library when I was in college.").

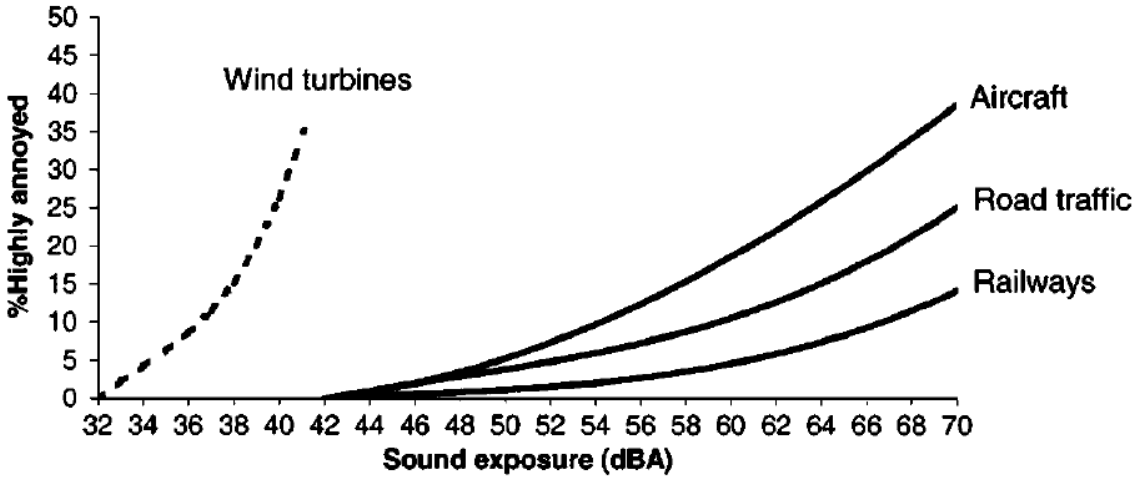
(2009) showed 18% of people annoyed at 35-40dBA and evidence of sleep disturbance at those noise levels. Lovko, Nov. 22 pf. at 4.

Another study, entitled WINDFARMperception, found that "at a calculated noise level of 30-35dBA, 10% were rather or very annoyed at wind turbine sound, 20% at 35-40dBA and 25% at 40-43dBA." ALB-RJ-4 at 10. People living in rural areas also tended to suffer more annoyance from wind turbines, as did those living in 'complex' or hilly terrain, such as the proposed Project site. Lovko, Nov. 22 pf. at 4. These studies consistently and clearly show annoyance and disturbance from wind turbine noise affecting a significant amount of the exposed public at levels below the 45dBA standard previously used by the Board. Dr. Irwin, on page 5 of his report, in fact confirmed that "sleep disturbance may occur at sound levels from wind turbine facilities as low as 35 to 40 dB." DPS-WI-2 at 5. Given these studies that indicate adverse health effects correlating with sound levels as low as 35dB (exterior) from wind turbines, the 45dB standard used by the Board in prior cases is too high to be protective of health.

The WHO 2009 report relied on by the petitioner in fact specifically makes the point that 40dB (exterior) is a threshold level of noise, and that once noise exceeds that level you are likely to have an adverse impact on public health. Lovko, Nov. 22 pf. at 4. GMP attempted to show that the 40dBA level, called the Lowest Observed Adverse Effects Level, indicates WHO's belief that there are no potential impacts below this level; however this is not what WHO stated in their 2009 report. Table 5.4 clearly shows that for the 30-40dBA range, "A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events." ALB-RJ-5 at 108.

Additionally, this threshold of 40dBA is the point for which there is sufficient evidence that adverse health effects occur for noise sources in general, and is not specific to wind turbines – in fact the WHO report did not address wind turbine noise at all. Here we are concerned with a specific type of noise, and wind turbine noise is not like other commonly encountered noises in rural communities. A study from the Netherlands showed wind turbine noise to be "more annoying than transportation noise or industrial noise at comparable levels, possibly due to specific sound properties such as a 'swishing' quality, temporal variability and lack of nighttime abatement." Lovko, Nov. 22 pf. at 4 (citing Pedersen et al 2009). This is shown in the following figure provided by renowned sleep expert Chris Hanning in his report entitled Sleep Disturbance and Wind Turbine Noise:

Figure 2. Sound level and annoyance for different noise sources (Pedersen E and Persson Waye, 2004)



Sound exposure is for wind turbines calculated A-weighted L_{eq} for a hypothetical time period and for transportation DNL.

ALB-RJ-4 at 32. WHO states that for sounds in the range between 30 and 40 dBA (exterior) the risks are dependent on the character of the outdoor noise source and the vulnerability of the

people to it.[3] James, Nov. 22 pf. at 3. Sources with significant low frequency content (such as wind turbine noise) and whose sound rises and falls by 5 dBA or more about once each second (such as the amplitude modulation common to wind turbine noise) would be expected to have a higher likelihood for causing sleep interference and subsequent adverse health effects. *Id.*[4]

We know from the experiences of people who live near wind turbines, and the results of various studies discussed by Dr. Lovko, that sleep disturbance from wind turbine noise occurs at sound levels below the 40 dBA LOAEL for general noise used by WHO. James, Jan. 24 pf. at 3. Dr. McCunney even admitted as much, stating that in his opinion annoyance from wind turbines noise may be reported at levels of 40 dBA and less, whereas other sources such as road traffic have not generally generated complaints at such levels, due to the swish-swish sound (amplitude modulation), which the literature suggests causes disturbance from turbines at lower levels than the transportation sources on which the WHO guidelines are based. ALB-Cross-7 at 57.

As Mr. James explained, while the 2009 WHO Guidelines provide that 40 dBA outside a home is the threshold for adverse health effects, the WHO report further states that a sound level of 30dBA at the building façade causes no measurable harm, whereas levels of 40dbA and higher are clearly harmful, with the range between 30 and 40 considered to be potentially harmful. James, Nov. 22 pf. at 2. The WHO Report adds that "closer examination of the precise impact

[3] According to WHO, 30 dBA $L_{night\text{-}outside}$ is the level at which adverse health effects from any type of outside noise are not expected – in other words this is the level at which we would not expect sleep disturbance from any outdoor noise source. James, Jan. 24 pf. at 3.

[4] Wind turbines have been shown to emit audible low frequency sounds. Audible low frequency sound can create annoyance more readily in some people. Low frequency noise has been recognized as a special problem, particularly to sensitive people in their homes, and the WHO report makes a point of emphasizing how low frequency sound deserves special attention and can create problems for people at noise levels that otherwise might not be problematic. The WHO report states that "for noise with a large proportion of low frequency sounds a still lower guideline (than 30dBA) is recommended," and adds that "it should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health." WHO concludes that "The evidence on low frequency noise is sufficiently strong to warrant immediate concern." Lovko, Jan. 10 pf. at 11.

will be necessary in the range between 30 dB and 55 dB as much will depend on the detailed circumstances of each case." ALB-RJ-5 at 109.

This last statement is very important, since WHO does not take into account the unique sound characteristics of wind turbines, as discussed above, and therefore, a noise limit must be set for this Project that takes into account the nature of wind turbine noise, the low existing background levels, and the WHO findings which suggest that even a 35dBA (exterior) limit may result in annoyance and sleep disturbance. Thus to be protective of the public who will be expected to live with nighttime turbine noise, the nighttime noise from the turbines must be less than the 40 dBA recommended by WHO and the 45dBA standard previously used by the Board. The literature suggests that for this type of Project, a 35dBA (exterior, 1 hour average) standard would be appropriate.

It must also be understood that even if the Board agrees that the WHO LOAEL is the threshold for adverse health effects, there is no hard boundary at 40 dBA (or 45 averaged over an hour). This value should be seen as a not-to-exceed limit, not one that is the design goal. Since turbine noise is more likely to annoy or awaken people than transportation noise, and if the model's predicted values are not what occurs in the real world (as discussed below), then there is a very good possibility that some people may be adversely effected. There needs to be a safety margin to ensure the public is protected, and the 45dBA standard does not provide adequate safety for the public's health and well-being. James, Nov. 22 pf. at 8.

Mr. James brought up a point at the hearings that is central to the concerns of Albany with regards to noise impacts: why would the Board use a standard that allows noise to reach levels that have been clearly shown to cause disturbance and annoyance? James, Feb. 23 at 43 ("When we look at a health standard we don't design our goal right at the brink of the risk.").

The precautionary principle suggests that a standard should be used that maintains noise below the level at which it becomes a problem, which has been repeatedly shown to be between 35 and 40 dBA (exterior). It remains unclear why a noise standard that allows people to potentially suffer annoyance and sleep disturbance will be protective when the best evidence to date shows levels above 35dBA (exterior) will leave a significant number of people at risk for health problems. Lovko, Jan. 10 pf. at 4.[5]

The noise standard that the Board has used in previous cases is not only set at a level that would not be protective of public health – since adverse health impacts have been shown to occur at levels well below 45dBA (exterior) – but further is not protective of public health because it is averaged out over an hour, allowing noise levels to exceed 30dBA (interior) for significant periods of time throughout the night – the level at which WHO states is necessary to protect healthy sleep. Irwin, Feb. 24 at 55.[6] The exterior standard that Dr. Irwin has recommended is even more problematic in this regard, as the 40dBA (exterior) would be averaged over a year, allowing noise levels to be well above 40dBA (exterior) 30dBA (interior) for significant periods of time, yet the standard could easily be met since wind turbines operate, on average, less than 30% of the time,[7] unlike transportation sources that are more consistent. The 70% of the time they are not operational would drastically reduce the average, since noise levels during those times would be zero; however this would not ensure that noise levels were

[5] Mr. Kane even agreed that if it was shown that there can be negative impacts, including annoyance, at or below 45 decibels, then the standard should be below 45 decibels. Kane, Feb. 9 at 72.
[6] WHO further has found that when levels exceed 32dBA interior (instantaneous), we can expect sleep disturbance to be a problem. ALB-RJ-6 at 103. This is not a yearly or even hourly averaged level, but rather is an instantaneous level at which WHO states sleep motility begins, and since the averaged time periods used by the Board would not prevent noise from exceeding this instantaneous level, they would not be protective of public health. That is why the WHO 2009 report states that "instantaneous effects such as sleep disturbance are better (correlated) with the maximum level per event LAMax" than with long term sound averages, as discussed herein. Lovko, Nov. 22 pf. at 5.
[7] And more often at night.

kept below levels at which adverse health impacts are likely during the times the turbines are operational. Irwin, Feb. 24 at 53-54.

The WHO 2009 report in fact states that "instantaneous effects such as sleep disturbance are better (correlated) with the maximum level per event LAMax" than with long term sound averages. Lovko, Nov. 22 pf. at 5. Averaging sound levels over a long period of time would allow sound levels to rise high enough to cause health problems and sleep disruption, while still being in compliance as long as there were periods of low sound levels to average out these higher peaks.

The fact that wind turbine sound often shows amplitude modulation makes it even more possible for this to occur. It has been shown that these pulses of sound can occur over a range of 5-10dB, meaning that the sound could spike into ranges disruptive of sleep, and yet the average sound level would suggest that the sound levels are within the prescribed limits and protective of health and sleep when in fact they are not. James, Jan. 24 pf. at 7. It does not take prolonged noise elevation to disrupt sleep and these brief peaks of noise have the potential to disrupt sleep many times during a night. Lovko, Nov. 22 pf. at 5. Albany is concerned that averaged noise standards previously used by the Board may not be sufficient, and submits that a noise standard that provides for an instantaneous Lmax of 30dBA (bedroom) would be more appropriate to protect public health.

GMP's experts provided no testimony on interior noise levels, and instead have focused entirely on exterior noise. Dr. McCunney, GMP's expert on the health effects of noise, has argued that "the risk of any direct adverse health effects at levels below 45dB(A) is virtually nonexistent." This is simply incorrect, and there are several reasons why the Board should find his testimony to be unreliable. This includes, as discussed herein, the fact that a 45dBA

(exterior) standard would not ensure that a 30dBA (interior) standard was also met. The failure of Dr. McCunney to even mention what noise levels are necessary in the bedroom to maintain healthy sleep indicates that he is not providing a thorough analysis of the potential for wind turbine noise to cause adverse impacts. It must be noted that when Dr. McCunney was asked "What is the recommended decibel level for an average person to remain asleep and how does it compare to wind turbine decibel levels?" he responded: "That's a good question and I don't know the answer to it. I don't know how low noise has to be or the sound has to be to promote healthy sleeping." ALB-Cross-7 at 38. This indicates that the Board cannot rely on Dr. McCunney for testimony regarding what noise levels are necessary to be protective of the public's health.

Furthermore, Dr. McCunney limits his statement regarding no impacts below 45dBA to direct adverse health impacts, ignoring the indirect health impacts that occur from annoyance and sleep disturbance at lower noise levels.[8] Dr. McCunney even admitted in discovery "that indirect health effects from wind turbine noise (such as sleep disturbance, annoyance, stress) can occur below 45dBA." ALB-Cross-6. Dr. McCunney thus chooses to ignore the fact that annoyance and sleep disturbance are direct adverse health effects in and of themselves according to WHO and many others (as set forth in the Jan. 10 Surrebuttal Testimony of Dr. Lovko at 5-7 showing that it is widely accepted by many noise and health professionals that annoyance and sleep disturbance adversely impact health and quality of life in and of themselves). Annoyance and

[8] Dr. McCunney appears fixated on noise induced hearing loss and other direct impacts of noise, which are not at issue in this matter – most likely because his experience is with occupational exposure to noise and not issues regarding annoyance and sleep disturbance from wind turbine noise. *See* Feb. 10 at 21-22 where Dr. McCunney claims that "the main health effect of high noise levels is really hearing loss," even though the Colby et al report he co-authored states that "the main health effect of noise stress is disturbed sleep which may lead to other consequences." DPS-Cross-3 at 4-3. *See also Id*. at 87.

sleep disturbance are also risk factors for other diseases such as depression, hypertension, cardiovascular disease, arthritis, respiratory problems, and decreased quality of life.

Additionally, Dr. McCunney's statement is completely unsupported by WHO. Even a cursory look at the main tables from this paper shows sleep disturbance starting at 35 dB Lamax inside, use of somnifacient drugs and sedatives at 40dB Lnight outside, self-reported sleep disturbance and environmental insomnia at 42dB Lnight outside, and complaints at 35 dB Lnight outside. Lovko, Jan. 10 pf. at 1-2. The WHO 2009 report goes on to state, "adverse health effects are observed at the level above 40 dB Lnight outside." *Id.* It is therefore clear that WHO does not agree that there are no impacts below 45dBA, and it bears repetition that the WHO was not addressing wind turbine noise and the amplitude modulation that has been shown to cause annoyance at lower levels. *Id.*

Moreover, Dr. McCunney has cited only one study to support his contention – repeated three times in his testimony – that "adverse health effects at levels below 45dB(A) [are] virtually nonexistent," which is the Miedema paper. As was made clear through cross examination, the Miedema paper, much like the WHO reports, does not discuss wind turbine noise at all, but is specific to transportation noise. McCunney, Feb. 10 at 93. Additionally, the authors of Miedema did not even address noise below 45dBA in their analysis, stating that "Low exposure levels (*Lnight* < 45 dB(A)) were excluded from the analyses because in general the assessment of those levels is relatively inaccurate and in situations with these low levels <u>other sources may be more important</u>." ALB-Cross-8 at 35 (emphasis added). Dr. McCunney in fact explained in the seminar he gave just last summer why wind turbine noise is different than transportation noise – the swish-swish effect (amplitude modulation) which causes disturbance at lower levels than are experienced with transportation noise. ALB-Cross-7 at 57. Wind turbine noise is therefore a

perfect example of what the Miedema authors were referring to when they stated that at levels below 45dBA sources other than transportation noise may be more important.

What is clear from reviewing the Miedema paper, is that it does not support Dr. McCunney's claim that "adverse health effects at levels below 45dB(A) [are] virtually nonexistent."[9] Dr. McCunney would perhaps have known this had he actually read the study, yet it is clear from his testimony he did not; or at least not closely enough to realize that it does not state that there are no adverse health impacts below 45dBA, or even support that contention.[10] McCunney, Feb. 10 at 94-97. It is beyond belief that an expert witness – and a research doctor at that – would repeatedly cite a study in his sworn testimony for a proposition that is not supported by the study. If a lawyer did that, it would be a clear violation of the duty of candor, and whereas Dr. McCunney is willing to provide testimony that is unsupported and clearly biased, the Board may not rely on his conclusions.[11]

This is further made apparent by Dr. McCunney's statements when he participated in a seminar just this past summer, wherein he made it very clear that if it was his home in the vicinity of a wind farm, he would want the noise levels to be kept "**below 35 decibels**; something along those lines; maybe 40," as measured outside the building. ALB-Cross-7 at 38 (emphasis

[9] Even if the authors had reached that conclusion, which they did not, Dr. McCunney agreed that the conclusions reached in the Miedema paper did not take into account the swish swish noise that accompanies wind turbine noise because it only looked at transportation noise. Feb. 10 at 100.

[10] Regarding Miedema (Dr. McCunney, Feb. 10 at 94):

> Q: So you would agree with me that the authors did not assess the impacts of transportation noise below 45 decibels, correct?
> A: Yes.

Also *See* the following exchange regarding Miedema (Dr. McCunney, Feb. 10 at 95):

> Q. They never say anywhere in here that there's no health risk or minimal health risk under 45 decibels, do they?
> A. I'm not sure whether they do or they don't….

[11] The fact that Dr. McCunney claimed during cross examination to have relied on the WHO report, which sites the Miedema paper, is inapposite, since he only cited the Miedema paper in his testimony, and as discussed above the WHO report does not support his contention either.

added). This statement was made when Dr. McCunney was speaking on his own behalf, as opposed to the paid testimony he provided on behalf of GMP in this matter, and was made after he had conducted his research on behalf of AWEA, on which his knowledge and opinion is based.[12] This therefore represents his true, unbiased position with regards to wind turbine noise, and is entirely consistent with the testimony provided by Albany's health expert, Dr. Lovko, whose literature review indicates that levels of self reported annoyance and sleep disturbance start to rise at about 35dB as measured outside the building. Lovko, Jan. 10 pf. at 6. It would simply be improper and unsupportable for the Board to continue to use a 45dBA standard when even the petitioner's medical expert has stated that if it were his home, he would want the noise kept below 35dBA (exterior).

While it is clear that annoyance from wind turbine noise occurs at levels below 40 and even 35dBA (exterior), GMP would have the Board believe that annoyance is simply a result of the fact that people do not like wind turbines and has nothing to do with the noise created by the turbines themselves. However, the peer reviewed papers on wind turbines and annoyance discussed by Dr. Lovko clearly show that annoyance increases with sound levels.[13] Thus annoyance is not simply a complaint made by people who do not like wind turbines. If noise levels were not important, you would not see the correlation of increasing annoyance with increasing noise levels so consistently and at such similar sound levels in all three major studies

[12] Dr. McCunney noted during cross examination that during this seminar he was representing himself based on his experience and perspective. Feb. 10 at 45. Dr. McCunney further testified that the opinions he expressed in the seminar were up to date, and "took into account all the published peer reviewed literature that was widely available." *Id.* at 46. He added that he has not read anything since he gave that seminar that has changed his opinions. *Id.* at 47.

[13] Dr. McCunney agrees, stating "that's a feature that you'll see that comes out a lot of the studies, that as the noise levels increase there's a greater percentage of people who report being annoyed by those noise levels." Feb. 10 at 51. He also added that "Certainly there's a phenomenon that's been recognized for many years that noise can cause annoyance." *Id*. at 73.

(the Pederson studies) on wind turbines. It also ignores the fact that even in areas where people have clearly welcomed wind turbines, problems with annoyance have occurred (such as in Vinalhaven, Maine). Lovko, Jan. 10 pf. at 9-10.

Furthermore, this argument ignores the fact that people are still suffering annoyance, even if it is linked to their dislike of the Project, or the fact that they are not receiving a financial benefit from the Project. The adverse impacts are no less real just because the cause is a combination of noise and aesthetics, or noise and a dislike of the project. The fact that someone dislikes the turbines may make the noise more of a focus for them, but this does not mean that the stress, annoyance and sleep disturbance, and the related cardiovascular and other health impacts, are not real for that person. Similarly, the fact that someone is gaining a financial benefit from the turbines may simply make them less apt to report their annoyance, and therefore does not suggest that people are only adversely affected when they were simply not in favor of the Project to begin with or receiving no financial benefit.

Dr. McCunney attempts to even downplay the issue of annoyance, stating that it is "not [] a pathological condition per se," however annoyance from noise is clearly a public health issue and ultimately in his discovery responses Dr. McCunney admits that annoyance is a symptom, which is why it is "not a pathological condition" and "not a recognized diagnosis." ALB-Cross-6. Dr. McCunney further admitted that "annoyance from noise may have an adverse effect on people's health and well being," and that "annoyance from wind turbine noise may cause recognized medical disorders, such as through sleep deprivation," seemingly contradicting the fact that he does not consider annoyance relevant to health. *Id.*[14]

[14] Dr. McCunney further stated during cross examination that annoyance is recognized by the World Health Organization as a critical health effect. McCunney, Feb. 9 at 25; DPS-Cross-4.

Indeed as Dr. Lovko points out, some researchers are now suggesting that noise annoyance might be more closely related to noise related health effects than objective measures (such as sound levels). Lovko, Jan 10 pf. at 10. Annoyance captures the interaction of the sound level with the effects on an individual and is likely a mediator in many of the health effects we see from noise exposure via increased autonomic stimulation and stress reactions. It makes little difference whether annoyance can be correlated with economic benefit or a person's personal regard for the project; if they are annoyed and suffering adverse health impacts from the project, then the project is having an undue adverse impact on public health.

Given that the research suggests annoyance and sleep disturbance can start to occur at sound levels from wind turbines at around 35dBA (exterior) and current studies show a marked rise in annoyance and sleep disturbance at sound levels greater than 35dBA (exterior), and further given that even GMP's expert Dr. McCunney has stated that if it were his home at issue he would want a standard that kept turbine noise at or below 35dBA – and as Dr, McCunney also admitted that there can be indirect health impacts from turbine noise below 45 decibels including sleep disturbance or deprivation, annoyance, and stress, and that these may cause an adverse effect on people's health and well being[15] – the Board's prior standard of 45dBA is insufficient, and a noise standard that provides for 35 dBA exterior is necessary to be protective of public health.

[15] McCunney, Feb. 10 at 40-41.

B. The background noise monitoring conducted by GMP overstates background noise levels, and the noise from the Project will have an undue adverse impact on the aesthetics and character of the area.

Findings:

24. The background sound study conducted by RSG used improper locations for the test instruments that do not meet the requirements for outdoor testing established by ANSI-ASA. James, Oct. 22 pf. at 3.

25. ANSI 12.9 part 2 provides standards for the assessment of the general community noise environment and establishment of baseline environmental sound levels; however Mr. Kaliski did not follow that standard. Kaliski, Feb. 22 at 70.

26. Mr. Kaliski did not calculate the accuracy of his monitoring, or factor in the appropriate confidence intervals found in the ANSI standard. Feb. 22 at 73-74.

27. These confidence intervals apply to both the spatial and temporal aspects of the monitoring. For the Spatial accuracy, the ANSI provides a +- 5dBA when 8 sites are used. Mr. Kaliski used only 6 sites. ALB-Cross-14 at 74-75; Feb. 22 at 75.

28. For Temporal accuracy, if monitoring was conducted only once over the period in question (1 year) a +3 -10 dBA confidence interval applies. ALB-Cross-14; Feb. 22 at 78-80.

29. A substantial moderate to heavy rain event occurred during the monitoring conducted by Mr. Kaliski, as well as periods of high winds. Mr. Kaliski did not remove these events from the results of his background monitoring. Feb. 22 at 56.

30. In the Sheffield case, Mr. Kaliski testified that the petitioner's monitoring overstated the typical background levels, and that "the high levels may be due to unusual events such as the snow storm, nearby brush and tree cutting, snow plowing, wet roads, utility trucks, etc, that were operating nearby when the monitoring was taking place and that are not typical of background noise levels in the area." ALB-Cross-9 at 3; Feb. 22 at 58-59.

31. A rain event would cause higher noise levels than a snow event. A rain event would cause wet roads. These would cause the averaged background noise levels found by Mr. Kaliski to be higher than what he defined as typical background noise levels in the Sheffield case. Feb. 22 at 60.

32. Mr. Kaliski admitted in discovery that "no analysis has been made to determine what the likely contributors of background sounds were during that day at those [monitoring] locations." ALB-Cross-13.

33. The typical background noise level in a rural area at night is 20-30dBA. This is consistent with the background noise levels found by Mr. Blomberg, as well as the L90 levels found by Mr. Kaliski, which are representative of the true long-term background noise in the area when events, such as high winds and rain, are removed from the monitoring data. Feb. 22 at 58, 66-67.

34. A noise standard of 45dBA, averaged over an hour, would allow turbine noise to exceed the typical nighttime background noise in a rural area (30dBA) by more than 15dBA (since the averaging allows noise to be above 45dBA for some period of time), and to exceed the lowest background noise levels that Mr. Kaliski found (i.e. the nighttime L90 for Location 6 of 16dBA) by as much as 30dBA. Feb. 22 at 45; PET-KHK-2.

35. Wind turbine noise that is 10dBA above the background would be clearly audible, even if the noise was only as high as 30-40 dBA. Kaliski - ALB-Cross-9 at 6. Such noises, when clearly audible, would be out of character with surrounding rural residential land uses. *Id.* at 7. Even a 5dBA change over background would be clearly noticeable, and an increase in 10dBA would be perceived as a doubling in loudness. An increase of 10-15dBA would cause the turbine noise to dominate over the background noise. Feb. 22 at 44-45; ALB-Cross-9.

36. "A 10-dB change, which is generally considered to be a doubling of the sound level, almost certainly causes an adverse community response." ALB-Cross-11 at 4-9

37. People expect quiet in a rural area. Kaliski, Feb. 22 at 54.

Discussion:

Both Albany and the Petitioner undertook background sound monitoring in order to establish the existing ambient sound levels in the area. This information becomes very important in examining how loud the noise from the turbines may be over background noise levels, which can affect not only the potential for adverse health impacts due to annoyance, but will determine whether the noise from the Project would have an undue adverse impact on the character of the area pursuant to the *Quechee* analysis. The averaged background noise levels provided by the petitioner are inflated and unreliable. GMP's expert did not follow applicable standards, and the results fail to include appropriate confidence intervals. The Board should therefore rely on the

background levels found by Mr. Blomberg, and the lower levels found by Mr. Kaliski (the L90 values),[16] which are indicative of the actual long-term background noise levels in the area.

The first issue Albany has with Mr. Kaliski's background noise monitoring is his complete failure to follow any specific standards. Mr. Kaliski testified that certain standards were followed, referring to the types of instruments used and the height at which they were set; however his responses were vague regarding what specific standards were followed for this analysis. Feb. 22 at 70-71. Mr. Kaliski did agree that ANSI 12.9 is the applicable ANSI-ASA standard for measuring outdoor noise; however he admitted to not having specifically followed it. *Id*.

ANSI 12.9 part 2 provides procedures for measuring outdoor noise. On page 1 of the document (ALB-Cross-14), it describes the applications of this standard, the first of which is "assessment of the general community noise environment and establishment of baseline environmental sound levels," which is exactly the purpose of the background sound monitoring Mr. Kaliski undertook, as is set forth in his report PET-KHK-2 at 11 ("Sound level monitors were installed around these areas to determine existing ambient sound levels.") (emphasis added). It is therefore clear that ANSI 12.9 part 2 was established to provide procedures directly applicable to the type of background monitoring Mr. Kaliski conducted and it remains unclear why Mr. Kaliski failed to follow these standards.

Had Mr. Kaliski followed these standards, he would have seen that there is a section on accuracy, which has both spatial and temporal components. Regarding spatial requirements, section 5.7 of ANSI 12.9 part 2 (ALB-Cross-14) states that for a class A survey, there would be a

[16] These are not even the lowest levels Mr. Kaliski found, which would me the Lmin levels, but rather only represent the 90th percentile of noise levels in the area. Mr. Kaliski in fact never presented what he found to be the lowest noise levels in the area.

+- of 3dBA at a confidence interval of 95%. For a class B survey, the confidence interval increases to +-5dBA. Mr. Kaliski, having not followed the standards, was unclear as to whether his survey was a Class A or B survey;[17] however it is clear from the table found on page 7 of the ANSI that a Class A survey would require 30 test sites, while a Class B requires 8 sites. Having used only 6 sites, Mr. Kaliski's study does not even meet the requirements for a Class B survey, and therefore it follows that the +- for his work would be at least 5dBA, and most likely higher. Section 8.2 of the ANSI further requires survey sites to be randomly chosen for surveys of residential areas, which was clearly not the case for Mr. Kaliski's survey.[18]

Similarly, the table found on page 9 of the ANSI shows the confidence intervals (accuracy) for the temporal aspects of the testing. It must be noted that in order to achieve the Class A survey, section 9.5.2.3 states that measurements must be taken "from each half of a year or time period of interest," which Mr. Kaliski's monitoring did not do, and therefore his monitoring would at best be a Class B survey.[19] ALB-Cross-14 at 11. The table on page 9 shows that a class B survey has a confidence interval of +3 -10, indicating that the results are not entirely reliable and may greatly overestimate the actual long-term background noise levels. Taken together, these confidence intervals indicate that the results of Mr. Kaliski's averaged

[17] See Kaliski, Feb. 22 at 73-74.
[18] The locations chosen by Mr. Kaliski were not only not randomly chosen as required by the ANSI standard, they appear to have been selected to increase the results of the testing. By locating the testing equipment near bushes, trees and roads, the results were inflated through increased noise from wind and cars driving on wet roads. This matter is covered in detail in LMG's Brief. *See* Exh-Pet-KHK-2 at 15-21; Blomberg, Oct. 22 pf. at 17-19, 21; James, Oct. 22 pf. at 7; Feb. 22 at 56,-57, 139, 173.
[19] This makes perfect sense since a study intended to show long-term background sound should take into account more than just one season. It is also important to note that the season that Mr. Kaliski did use – late fall – may potentially provide the highest background noises of the entire year, since as Mr. Kaliski notes there were dry leaves on the trees, PET-KHK-2 at 12, and fall is a time with windy conditions (as shown in Mr. Kaliski's figures, creating increased noise as wind moves through dried foliage.

background noise levels may be overstating the actual long-term background noise by many decibels.[20]

In addition, the ANSI requires that the monitoring be tested for measurement precision, but adds that the data must be first shown to be independent. ALB-Cross-14 at 8-9. Independence cannot be inferred from consecutive daily samples, such as the monitoring performed by Mr. Kaliski, but must be shown to be independent through a test set forth in section 9.4.2. Mr. Kaliski did not perform this test, nor did he attempt to calculate the accuracy measurement of his survey. Feb. 22 at 78-79. He failed entirely to test for, or in any way adjust his results based on the accuracy issues set forth in the ANSI, and therefore his results must be taken for what they are – an imprecise and flawed estimate that did not follow applicable standards or take into consideration the accuracy of the results and applicable confidence intervals.

Moreover, while Mr. Kaliski stated that he attempted to show through his monitoring what the "typical background noise levels" were in the area, the results presented by Mr. Kaliski included noises that he himself has previously argued are not typical of background noise levels, and which inflate his findings. In the Sheffield case (Docket No. 7156) Mr. Kaliski – when representing the Town of Sutton, which was opposed to the Project – took issue with the petitioner's background monitoring, stating that "The high levels may be due to unusual events such as the snow storm, nearby brush and tree cutting, snow plowing, wet roads, utility trucks, etc, that were operating nearby when the monitoring was taking place and that are <u>not typical of</u>

[20] This was summed up in the hearing as follows (Kaliski, Feb. 22 at 80):

> Q. Okay. So my point here is that there is a plus or minus interval for spatial sampling, there is a plus or minus for temporal sampling, and you didn't calculate either of those or apply it to your results; correct?
> A. That's correct. Yes.

background noise levels in the area." ALB-Cross-9 at 3 (emphasis added). Yet during the monitoring for Mr. Kaliski's background noise study in this matter, he readily admits that there was a period of moderate to heavy rain from 8:00 PM on October 23rd to 2:30 AM on October 25th, and that he did not remove that event from his data results. PET-KHK-2 at 12; Feb. 22 at 56.

This rather long period of moderate to heavy rain would have caused the very same noises associated with cars passing by on wet roads that Mr. Kaliski specifically stated were not typical of background noise levels in the Sheffield case. Moreover, Mr. Kaliski listed a snow event as an "unusual event" that was not typical of background levels and inflated the results of the Sheffield monitoring, yet he had to agree during the hearings that a rain event is more likely to cause high noise levels than a snow event. Feb. 22 at 60.

In fact, Mr. Kaliski admitted in discovery that "no analysis has been made to determine what the likely contributors of background sounds were during that day at those [monitoring] locations." ALB-Cross-13. So, even though according to his testimony in Sheffield it was his opinion that unusual events that occur while conducting background monitoring are not typical of background noise levels and can inflate the findings, Mr. Kaliski simply did not consider this in his analysis for this case. He did not determine if there were unusual events, and made no effort to remove those events from the data.

Mr. Kaliski's failure in this case to remove noises that he himself has stated are not indicative of typical background noise levels indicates that he is willing to make one argument when his client is opposed to a Project, and a wholly contradictory argument when it suits his new client's interests. This shows incredible bias, and the Board should be wary of the

testimony of any expert who so willingly alters his opinion based on who happens to be paying him.[21]

The results of the monitoring conducted by Mr. Kaliski, while showing inflated averages, still provide some important information. For example, at location 6 the daytime L90 was 17dBA and the nighttime was 16dBA. Kaliski, Nov. 22 pf. at 9. That means that for 10% of the time, noise levels were below these levels. Since Mr. Kaliski used a monitoring period of 6 days, that means that there were at least 12 hours during that week where noise was below 17dBA at this location. *Id.* Further, since the L50 values were 25 and 24 (day/night) that means there were more than 60 hours where the background noise was below 25dBA at this location. These are very low noise levels, and are indicative of the quiet rural area where this Project is proposed.

While Mr. Kaliski attempted to argue that the background noise monitoring conducted by Mr. Blomberg was intended to depict the lowest background sound levels in the area, as opposed to his "typical" noise levels, Mr. Blomberg actually followed the ANSI-ASA 12.9 Part 3 standards,[22] and provided what the standard defines as long-term background sound.[23] In fact,

[21] This is not the only instance of Mr. Kaliski altering his opinion to suit his client's interests. In the Sheffield case he specifically stated that the EPA guidelines for noise were outdated and unreliable, since more recent studies suggested that lower noise levels were needed than the EPA guidelines to be protective of public health (ALB-Cross-10 at 4); yet in this matter he has included the very same EPA guidelines (and the BLM PEIES that relies on the EPA Guidelines) in his report, failing to note his own arguments that the Board should not rely on these outdated standards when he represented Sutton. PET-KHK-2 at 8-9. This again shows incredible bias and a predilection to provide whatever testimony suits his clients, suggesting that Mr. Kaliski is not a reliable witness.

[22] Part 3 of the ANSI-ASA 12.9 standard is specific to background noise measurements taken with an observer present, which Mr. Blomberg complied with. Part 2 of the standard, discussed above, is applicable when no observer was present, as was the case with Mr. Kaliski's monitoring.

[23] The long term background levels are defined by American National Standards Institute (ANSI) Standard S12.9, Part 3. The standard states:
"Background sound can be divided into two categories: (1) Short-term background and (2) long-term background sound. Short-term background sounds are caused by such sources as a nearby barking dog, a nearby accelerating motor vehicle, or an aircraft fly over. Short-term background sounds are relatively

Mr. Kaliski's results showed lower sound levels than those found by Mr. Blomberg, for significant amounts of time, as shown above with location 6 where Mr. Kaliski found levels below 17dBA for several hours during the day and night.

Mr. Blomberg's results, showing noise levels in the mid to high twenties and in some areas just around 30dBA (Blomberg, Oct. 22 pf. at 18-20), are consistent with the L90 results of Mr. Kaliski (which would be indicative of the true long-term background noise levels once the peak noises such as rain and wet road events, which Mr. Kaliski has stated are not typical background noises, are removed from the data), as well as the BLM PEIS that Mr. Kaliski quotes in his report, and figure 2 of his report depicting "common sounds in decibels," both of which indicate that the expected background noise level in a rural area is around 30dBA. PET-KHK-2 at 3, 8. The findings of Mr. Blomberg are therefore not the lowest background sound levels in the area, but they are indicative of the quiet nature of the area, and the low noise levels that residents currently experience as typical, long-term background noise of 30dBA or less.

The quiet rural soundscape of this area, and the low background noise levels currently enjoyed by residents, is important when considering whether the Project would have an undue adverse impact on aesthetics pursuant to the *Quechee* analysis. It is alarming that the petitioner has failed entirely to analyze whether the Project would have an undue adverse impact on the aesthetics of the area due to turbine noise, and have provided no assessment under the *Quechee* test to determine compliance with 30 V.S.A. § 248(b)(5) for noise related aesthetic impacts.

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loud and their time of occurrence and sound exposure cannot be statistically described during the basic measurement period. Long-term background sound includes the composite of all sounds from sources far and near which are (1) not short-term background sounds and (2) not sound from the specific noise source under study." Blomberg, Jan. 24 pf. at 27-28.

10 V.S.A. § 6086(a)(8), incorporated through 30 V.S.A. § 248(b)(5), requires the Board to find that a proposed Project "will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites or rare and irreplaceable natural areas." Pursuant to this, the applicant must provide sufficient information for the Board to make affirmative findings that the test for aesthetics, known as the *Quechee* test, is met. *See, e.g., Re: Times and Seasons, LLC and Hubert K. Benoit,* Docket No. 3W0839 -2-EB (Altered), Findings of Fact, Conclusions of Law, and Order at 38 (Vt. Envtl. Bd., Nov. 4, 2005). GMP has clearly not met this burden.

Pursuant to the *Quechee* test, in order to determine whether a proposed Project would cause an adverse effect on the aesthetics of the area, the Board first considers whether a proposed Project would be in harmony with its surroundings – in other words, whether it would "fit" the context within which it would be located. In making this evaluation, the Court examines a number of specific factors, including the nature of the Project's surroundings, and the compatibility of the Project with those surroundings.[24]

Mr. Kaliski has not even attempted to describe the nature of the Project's surroundings regarding noise. While he defines "soundscape" as the combination of sounds that characterize a listening environment," PET-KHK-2 at 11, he does not actually characterize the soundscape or discuss what combination of sounds occur in the area – even admitting that "no analysis has been made to determine what the likely contributors of background sounds were during that day at those [monitoring] locations…." ALB-Cross-13. All Mr. Kaliski provided were inflated

[24] The aesthetics inquiry focuses on whether the Project will "be in harmony with its surroundings," In re *Quechee* Lakes Corp., Permit Nos. 3W0411-EB & 3W0439-EB, Findings of Fact, Concl. of Law, & Order, at 18 (Vt. Envtl. Bd. Nov. 4, 1985); that is, "whether it will 'fit' the context of the area where it will be located." Re: Susan Dollenmaier and Martha Dollenmaier Spoor, Permit #3W0125-5-EB, Findings of Fact, Concl. of Law, & Order, at 11 (Vt. Envtl. Bd. Feb. 7, 2005).

background noise levels measured in decibels, which included noises that even he has testified were not typical of background noise, as discussed above, and does not characterize the sound.

Mr. Blomberg, on the other hand, provided testimony and maps (Exhibits LM-LB-2, 4, 5, 6, and 7) showing the impact on the character of the neighborhood and the compatibility of the noise from the Project with the surroundings. The Audibility Map (Exhibit LM-LB-4) shows the areas impacted. The Loudness Map (Exhibit LM-LB-5) shows how much louder the Project will be than the background. The Sleep Interference Map shows the lands (which are zoned to allow housing) for which sleep interference and sleep interference health impacts can occur. Mr. Blomberg's testimony, as well as the fact that current noise levels in the area around the Project would be exceeded by well more than 10dBA by turbine noise for significant periods of time, which is a doubling of noise and would make the Project clearly audible according to Mr. Kaliski, indicate that the Project would not "fit" the character of the area, and the noise from the Project would therefore have an adverse impact on the character of the area.

Even if we were to accept that background noise, measured only in dBA without any characterization, can be used to define the character of the area, it is clear that this Project would increase background noise levels to a degree that would be considered shocking and offensive.[25] Mr. Kaliski testified in the Sheffield case that wind turbine noise that was 10dBA above the background would be clearly audible, even if the noise was only as high as 30-40 dBA. ALB-Cross-9 at 6; Kaliski, Feb. 22 at 43. He further testified that such noises, when clearly audible,

[25] Pursuant to the *Quechee* analysis, the adverse impacts are considered undue if the Project would be considered shocking and offensive to the average person. *In re Quechee Lakes Corp.*, Permit Nos. 3W0411-EB & 3W0439-EB, Findings of Fact, Concl. of Law, & Order (Vt. Envtl. Bd. Nov. 4, 1985). The former Environmental Board has ruled that a Project is shocking and offensive if it is so out of character with its surroundings that it significantly diminishes the aesthetic qualities of the area. *Re: Times and Seasons, LLC and Hubert K. Benoit*, Docket No. 3W0839 -2-EB (Altered), Findings of Fact, Conclusions of Law, and Order at 49 (Vt. Envtl. Bd., Nov. 4, 2005); *Re: Hannaford Brothers*, Docket No. 4C0238-5-EB, Findings of Fact, Conclusions of Law, and Order at 20 (Vt. Envtl. Brd., Apr. 9, 2002).

would be out of character with surrounding rural residential land uses. ALB-Cross-9 at 7; Kaliski, Feb. 22 at 43-45. As Mr. Kaliski explained, even a 5dBA change over background would be clearly noticeable, and an increase in 10dBA would be perceived as a doubling in loudness. An increase of 10-15dBA would cause the turbine noise to dominate over the background noise. *Id*.

This Project was designed to meet a standard of 45dBA, averaged over an hour, which would allow turbine noise to exceed the typical nighttime background noise in a rural area (30dBA) by more than 15dBA (since the averaging allows noise to be above 45dBA for some period of time), and to exceed the lower background noise levels that Mr. Kaliski found (i.e. the L90 for Location 6) by nearly 30dBA. We can therefore expect that if the Board uses the same standard it has used in previous cases, the wind turbine noise will be well more than twice as loud as current background noise levels in the area, and that it will be clearly audible, and will dominate over background noise – even reaching 30dBA over background for as much as 10% of the time in some locations. Such noise would therefore be completely out of character with the surrounding quiet rural residential area, and clearly shocking and offensive. *Id*. at 7-9. This is simply untenable, and will drastically alter the soundscape, causing an undue adverse impact to the aesthetics of the area in violation of the *Quechee* analysis as incorporated through 30 V.S.A. § 248(b)(5).

In fact, the BLM PEIS that Mr. Kaliski cites on page 8 of his report provides a very important statement regarding the potential for noise to cause an adverse community response. While Mr. Kaliski provided a quote from section 4.5.1 of the BLM PEIS suggesting that on BLM lands, at least, a 10dBA increase would be unlikely to cause an adverse community response, he chose to leave out of his report the statement that the BLM made just before the

quote he provided, which states "A 10-dB change, which is generally considered to be a doubling of the sound level, almost certainly causes an adverse community response." ALB-Cross-11 at 4-9 (emphasis added). The fact that Mr. Kaliski deliberately left out this important statement, while including only the statement regarding BLM land (where few if any people actually reside), indicates that he has no problem cherry-picking the sources he relied on, and again shows that he provided biased and untrustworthy testimony to this Board.

The statement made in the BLM PEIS in fact indicates that this Project, which would cause background noise to increase by well more than 10dBA above background – even by 15-30dBA in some instances for substantial amounts of time – is certain to cause an adverse community response, indicating that the noise would be so out of character with the area as to be shocking and offensive. Therefore, pursuant to 30 V.S.A. § 248(b)(5), a CPG cannot be issued.

Further, Mr. Blomberg's analysis of the audibility of the Project, and the impacts on the aesthetics of the area was uncontroverted by GMP. Mr. Kaliski failed to provide an audibility analysis, or conduct a study to determine the annoyance potential of the wind turbines. Mr. Blomberg's testimony shows that this Project, by increasing the noise levels in this quiet rural area, would violate the conditional use criteria that apply to wind farms (that they must not adversely impact the character of the area), thereby contravening a clearly written community standard pursuant to the *Quechee* analysis.[26] This was also uncontroverted by GMP, and

[26] Pursuant to the *Quechee* analysis, the adverse impacts are considered undue if the Project violates a clear community standard intended to preserve the aesthetics of the area. *In re Quechee Lakes Corp.*, Permit Nos. 3W0411-EB & 3W0439-EB, Findings of Fact, Concl. of Law, & Order (Vt. Envtl. Bd. Nov. 4, 1985). Town plans and zoning bylaws are documents that establish a clear written community standard for preservation of the aesthetics of the area. *Re: Burlington Broadcasters, Inc. d/b/a WIZN, Charlotte Volunteer Fire and Rescue, & John Lane*, Docket no. 4C1004R-EB, MOD at 10-11 (Vt. Envtl. Bd. Nov. 25, 2003).

requires the Board to find that the Project does not meet the requirements of 30 V.S.A. § 248(b)(5).

Lastly, the petitioner has failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the proposed Project with its surroundings – reducing the noise through setbacks or other changes to the Project's design.[27] In *Georgia Mountain*, the Board noted that the Petitioner had taken reasonable steps to mitigate any potential noise impacts, such as "using turbines designed to minimize noise impacts" and "conducting pre-construction turbulence modeling to ensure additional noise due to excessive turbulence is avoided." *Georgia Mountain*, Docket No. 7508, Order of 6/11/2010 at 57. GMP has undertaken neither of these steps, and is proposing to use the loudest possible turbines, which would not even meet the 45dBA standard without a noise reduction mode that has not been proven to work. Using smaller, quieter turbines could reduce the noise impacts to the community. GMP could also use fewer turbines, and has not shown that it would be unreasonable to position them (i.e. using setbacks) to reduce the noise experienced in the area. Furthermore, Mr. Kaliski provided no turbulence modeling, and Mr. Pughe stated in discovery that "Turbine layout was not specifically designed to reduce turbulence." Blomberg, Jan. 24 pf. at 33. Therefore, GMP has failed to take the reasonable mitigating steps identified by the Board in *Georgia Mountain*.

Moreover, the Project needs to be sited with an adequate setback to reduce the noise on adjoining properties. As Mr. Blomberg discussed, GMP is attempting to use non-participating

[27] Pursuant to the Queeche analysis, the adverse impacts of the Project are considered undue of the applicant has failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the proposed Project with its surroundings. *In re Quechee Lakes Corp.*, Permit Nos. 3W0411-EB & 3W0439-EB, Findings of Fact, Concl. of Law, & Order, at 18-20 (Vt. Envtl. Bd. Nov. 4, 1985).

neighboring lands as a noise buffer for the Project, which is not only unfair to neighboring landowners, but may be considered shocking and offensive in its own right. Blomberg, Oct. 22 pf. at 12, 24.

In order to protect the character of the area, the Project should use setbacks and a property line standard that would limit the noise levels on adjoining properties to only 10dBA above background, which would be a doubling of the current noise levels, thereby providing a balance between the use of property for the Project and the need to protect the area from undue adverse noise impacts. Since we can assume from the background noise monitoring and literature on this topic that the average nighttime noise levels are 30dBA or less, that would require a property line standard of 40dBA. This, in conjunction with a 35dBA exterior standard at residences, would protect both the character of the area, as well as the health of those living in the vicinity.

As GMP has not even analyzed the effects turbine noise would have on the character of the area thereby not meeting their burden, and whereas the noise levels may be shocking and offensive, violate a clearly written community standard and GMP has failed entirely to address whether they have taken all reasonable means to reduce the noise impacts (which clearly they have not), this Project violates the *Quechee* test, and a permit may not be issued pursuant to 30 V.S.A. § 248(b)(5).

C. The Project as proposed would not be able to meet the noise standard used by the Board in prior wind cases.

Findings:

38. Mr. Kaliski's results indicate that several homes will experience noise levels right up to the 45dBA standard. PET-KHK-2 (tables 6 and 7) (addendum at 9, Tables 2 and 3).

39. Mr. Kaliski's modeling was based on ISO 9613-2. It must be noted that the program Mr. Kaliski used, the Cadna-A model, which is based on ISO 9613-2, is a general purpose model designed for modeling noise from common urban noise sources like industrial plants, roads, and railways, and is not specific to wind turbines. James Oct. 22 pf. at 9-10.

40. A model algorithm designed specifically for wind turbines, instead of the general purpose Cadna/A (ISO 9613-2 based) model, would increase the predicted sound levels at the receiving properties by as much as 1.5 to 7.0 dB above the levels predicted by the ISO algorithm. James Oct. 22 pf. at 9-10.

41. The Cadna-A model (ISO 9613-2) was not created to deal with the distances and mean height differences between source and receiver that are at issue for this Project, and was not validated by the ISO authors for this type of use. ALB-Cross-17 at 13-14; Feb. 22 at 105-106.

42. The ISO was validated for distances of 0-100 meters, and for 100-1,000 meters, and was not validated at distances greater than 1,000 meters. ALB-Cross-17 at 13-14.

43. The ISO used as the basis for the model does not address accuracy at a mean height between source and receiver above 30 meters. ALB-Cross-17 at 13-14.

44. Table 5 of the ISO suggests that an estimated accuracy of +-3dBA would apply to the modeling, and this should be considered a very conservative estimate of accuracy for this Project. ALB-Cross-17 at 13-14.

45. The ISO 9613-2 model is only valid for a range of wind speeds of 1 to 5 m/s, and only considers wind speeds at 3 to 11 meters high. ALB-Cross-18 at 12.

46. The Concawe model document – provided by Mr. Kaliski in discovery and submitted as ALB-Cross-19 – on page 28, shows that there is a 95% confidence limit for the model, and the table found on that page shows that for each meteorological category there is a confidence interval that ranges from 4.5 to 6.9 dBA. ALB-Cross-19 at 28. Kaliski did not add in these confidence intervals to his model results. Feb. 22 at 122.

47. This model is not very accurate for predicting the sound level at a certain place, since the "sound level would be influenced by parameters not contained in the model," which as they state is reflected in the "considerable standard deviation of measured sound levels, even for a fixed measuring location." ALB-Cross-19 at 29.

48. Mr. Kaliski provided an adjusted model, which uses the Concawe adjustments to take into account the meteorological effects on sound propagation. PET-KHK-2 at 29.

49. The Concawe document specifically states that the model has only been validated "for wind speeds of up to 7 meters/second. Any extrapolation beyond these ranges should be

done with caution." ALB-Cross-19 at 43. Wind turbines operate at wind speeds above 7m/s and Mr. Kaliski used the model to estimate noise impacts at speeds above 7m/s.

50. This model, as with the base ISO 9613-2 model within which the Concawe adjustments are made, is only valid for sources of much lower height than the proposed Project, and is based on temperature and wind measurements taken at no more than 11 meters in height. ALB-Cross-19 at 16.

51. The Concawe model was created to model noise from petrochemical plants, and was validated for three specific plants, the sources of noise from which were no more than 25 meters in height, and these plants were on flat terrain. ALB-Cross-19 at 13-14.

52. The Concawe document explains that the meteorological component of the model was based on data collected at 1 meter and 11 meters above the ground, and adds that "whilst this can only indicate the variation in temperature with height close to the ground, it has been shown empirically that, for the distances being considered, it is the first 30 meters of the atmosphere which affects noise propagation." ALB-Cross-19 at 16.

53. "Meteorological conditions can significantly affect sound propagation. The two most important conditions to consider are wind shear and temperature lapse." PET-KHK-2 at 23. Mr. Kaliski adds that "Wind shear is the difference in wind speeds by elevation and temperature lapse rate is the temperature gradient by elevation." *Id*. It is therefore clear that elevation is crucial to the two meteorological conditions that Mr. Kaliski states can significantly affect sound propagation.

54. The only validation that Mr. Kaliski provided, found at ALB-Cross-18, indicates that the facility was on flat farmland, and not a ridgeline facility such as the proposed Project. The validation was only done using monitoring at distances below 610 meters, whereas many of the receivers at issue in this docket are quite a bit further away (1,000 meters or more).

55. Ground effects are used in the modeling to take into account the ground's ability to attenuate sound – to absorb, scatter or reflect it. Mr. Kaliski testified that the model results he has provided in tables 6 and 7 of his report did take into account ground effects, and that this would have reduced the dBA at these properties by as much as 3dBA. Feb. 22 at 125.

56. The Concawe model document specifically states that where the grazing angle is greater than 5 degrees, the ground effects should be zero. ALB-Cross-19 at 11.

57. Mr. Kaliski admitted that the grazing angles at issue in this case are well above 5 degrees, stating they are between 12-18 degrees for the homes shown in tables 6 and 7 of his report. Feb. 22 at 115.

58. The sound power of the turbines that was used for the modeling was provided by the manufacturer and Mr. Kaliski was not aware of whether the information is independently verified. Feb. 22 at 82.

59. Calculations of sound power are based on conditions that underestimate the worst-case sound power, since the tests are performed to the IEC 61400-11 standard, which calls for testing under conditions of a neutral atmosphere, with a wind shear exponent of 0.16. James, Jan. 24 pf. at 4-5.

60. This weather condition produces the lowest sound emissions from wind turbines. Both the steady aerodynamic sounds and any blade swish are at their minimum in these conditions. *Id.*

61. Since the sound power of the turbine that is plugged into the model is only valid for a wind shear of 0.16, it does not indicate the sound power level at higher wind shears, and the model may therefore underestimate resulting noise levels. James, Jan. 24 pf. at 4-5, 8.

62. Mr. Kaliski's adjusted model only modeled the refraction and attenuation of the sound during high wind shear conditions, and the sound power level that was used in the model was not adjusted for the high wind shear condition (i.e. Mr. Kaliski only used the manufacturers sound power data based on neutral atmospheric conditions (0.16 wind shear), even for scenarios with higher wind shears). James, Nov. 22 pf. at 6.

63. According to Van Den Berg, during high wind shear conditions, when the angle of attack cannot be optimal, the sound power level from turbines can be anywhere from just a slight bit higher, to as much as several dBA higher, depending on how off the angle is. ALB-RJ-6 at App. B-5.

64. Mr. Kaliski did not perform the necessary calculations for each of his models meteorological conditions to determine by what degree the angle of attack may be off by, so we are left to wonder what changes in sound power should have been applied. Feb. 22 at 93-94.

65. High wind shear conditions would result in noise levels approximately 5dBA higher than Mr. Kaliski has indicated during those conditions. James, Nov 22 pf. at 6-7.

66. The Project site experiences high wind shear conditions at least 10-15% of the time. Kaliski Nov. 22 pf. at 12-13. These conditions occur at night and early morning. This information is based on the met towers, which do not calculate wind speeds at the height of the top of the turbine blade rotation, so may be understating the actual wind shear on the site. *Id*.

Discussion:

i. The modeling conducted for the Project underestimates the noise that will be experienced at homes in the vicinity of the Project.

The noise modeling conducted for a Project such as this, which has the potential to cause public health impacts through annoyance and sleep disturbance from noise, is incredibly important for several reasons. First of all, it is essential to ensure that residents in the vicinity of the Project will not be adversely affected; however, since it is very difficult to react to noise issues after the Project is built – given that moving turbines is not possible and having to turn them off for certain periods affects the economic and environmental benefits of the Project – it is necessary to site them in a safe manner using modeling to ensure that there will not be any problems.

Second, monitoring of the noise from the turbines is difficult and expensive. According to GMP it is not cost effective to monitor all year long, and monitoring inside a neighbor's bedroom for extended periods is intrusive. Kaliski, Feb. 22 at 21. GMP has not, in fact, even created a monitoring plan for this Project (*Id*. at 155), however the outline provided by Mr. Kaliski in his surrebuttal testimony suggests that monitoring would take place only twice during the year following construction, for as little as one week. Kaliski, Nov. 22 pf. at 24-25. While Albany believes that this is entirely inadequate, as discussed further below, it is indicative of the importance of modeling, since it is not possible to ensure through monitoring that the noise levels are in fact meeting the applicable standard at all times and weather conditions.

The modeling conducted by Mr. Kaliski, however, does not provide an adequate representation of the potential noise levels that will be experienced within the vicinity of the Project. Mr. Kaliski's results indicate that several homes will experience noise levels right up to the 45dBA standard (which as discussed above is not protective of public health); however the

modeling is based on various assumptions that render the results unreliable, and Mr. Kaliski has failed to take into account several matters that suggest his results underestimate the noise that may be experienced by neighbors in the vicinity of the Project.

Mr. Kaliski's modeling was based on ISO 9613-2. It must be noted that the program Mr. Kaliski used, the Cadna-A model, which is based on ISO 9613-2, is a general purpose model designed for modeling noise from common urban noise sources like industrial plants, roads, and railways, and is not specific to wind turbines. It therefore does not take into account the amplitude modulation that can increase sound pressure levels from turbines. The Cadna/A (ISO 9613-2) model is only one of several models that could be selected for modeling noise, and other models, such as a Swedish model discussed by Mr. James,[28] take into account the fact that wind turbine sounds do not follow a spherical decay pattern, which the Cadna-A model uses. For the homes and lands closest to the wind turbines (within approx. 1000 m) a model algorithm designed specifically for wind turbines like the Swedish model, instead of the general purpose Cadna/A (ISO 9613-2 based) model, would increase the predicted sound levels at the receiving properties by as much as 1.5 to 7.0 dB above the levels predicted by the ISO algorithm. James, Oct. 22 pf. at 9-10.

Even if the Board were to accept Mr. Kaliski's testimony that the Cadna-A model is used for these types of Projects, it is clear from the model itself that it was not created to deal with the distances and mean height differences between source and receiver that are at issue for this

[28] Described by Dr. John Harrison, Retired Professor of Acoustics, Queens, in his Sept. 12. 2010 paper titled: "Off-Shore Wind Facilities: Renewable 10 Energy Approval Requirements" (Exhibit LMG-RJ-2 at 3).

Project, and was not validated by the ISO authors for this type of use.[29] Furthermore, Mr. Kaliski's complete failure to include any discussion of the accuracy and applicable confidence intervals for the model indicate that his results are unreliable.

The ISO 9613-2 (ALB-Cross-17) provides an estimated accuracy of the results created from the model, which is found in Table 5 on page 14 of the ISO document. The estimated accuracy is based on the mean height between the source and the receiver, and the distance to the receiver. Regarding distance, it is clear from the table that the ISO was validated for distances of 0-100 meters, and for 100-1,000 meters, and was not validated at distances greater than 1,000 meters. Since the homes that may be affected by noise from the Project are just over 1000 meters away, it is apparent that the model was not created to address noise at these distances, and the resulting confidence intervals may be greater at these larger distances.

Moreover, the model only provides confidence intervals (estimated accuracy) for a mean height difference between source and receiver of 0-5 meters, and 5-30 meters; however the mean height difference between source and receiver for this Project is on the order of 150+ meters. It is therefore clear that the ISO used as the basis for the model does not address accuracy at a mean height between source and receiver above 30 meters, and therefore was clearly not intended to be used, and was not validated for, noise sources such as turbines. As Mr. Kaliski

[29] Mr. Kaliski, in an article he authored that was intended to validate the ISO 9613-2 model (as well as the Concawe meteorological adjustments discussed below), upon which the Cadna-A model is based, found that:

> While the ISO 9613-2 methodology specifically recommends spectral ground attenuation for flat or constant-slope terrain with G=1, in this case, it underestimated the sound levels. This may be due to the height of the hub (80 m) as compared with typical noise sources. That is, the sound waves may not significantly interact with the ground over that distance…. wind turbines often operate with wind speeds that are higher than ISO 9613-2 recommends. The combination of higher wind speeds and an elevated noise source may result in greater downward refraction.

ALB-Cross-18 at 13-14. This indicates that the ISO 9613-2 model used by Mr. Kaliski may not be as accurate, or conservative, as he suggested during the hearings in this matter.

did not perform the calculations used by this ISO to determine the estimated accuracy where the mean height between source and receiver is greater than 30m, we are left to wonder what the estimated accuracy of the model is for this situation.

At a minimum, however, Table 5 of the ISO suggests that an estimated accuracy of +-3dBA would apply to the modeling, since that is what is provided as the confidence interval for a noise source at a distance of up to 1,000 meters, and a mean height difference of up to 30 meters. It is not unreasonable to expect this to be even higher for the larger distances and heights at issue in this matter, and therefore the +-3dBA should be considered a very conservative estimate of accuracy.

Additionally, the ISO 9613-2 model, according to an article written by Mr. Kaliski (Propagation Modeling Parameters for Wind Power Projects), is only valid for a range of wind speeds of 1 to 5 m/s, and only considers wind speeds at 3 to 11 meters high. ALB-Cross-18 at 12.[30] This shows just how inaccurate and inapplicable the ISO 9613-2 model is for noise from wind turbines, which operate at wind speeds well in excess of 5 meters/second, and at heights well above 11 meters in height.

Perhaps not surprisingly, Mr. Kaliski failed entirely to address these issues in his analysis, since it would show that his results should have included an extra 3dBA (and perhaps more) to ensure that his results depicted the worst-case scenario for the Project.[31] As this would

[30] According to Mr. Darling, a minimum cut in speed of 5 m/s is required to reduce bat fatalities. Darling, Oct. 22 pf. at 9-10.

[31] While Mr. Kaliski suggested that the sound power levels of the turbines were increased by 1.5-2dBA at the manufacturers recommendation to account for inaccuracies in the testing for sound power from the turbine models, the ISO specifically states that the estimates of accuracy discussed herein are "independent of uncertainties in sound power determination." page 13. Therefore, regardless of what Mr. Kaliski put in the model for sound power, which as discussed herein may not have been accurate for high wind shear conditions, there is still an inherent inaccuracy in the model, and the ISO states that it can be off by at least 3dBA.

make it harder for the Project to meet the standard Mr. Kaliski recommends, especially for those turbines that need to be operated in NRO mode, he conveniently ignored this estimated accuracy – even though it is found in the very ISO 9613-2 document that his model is based on and which he provided in discovery.

This is not the only instance wherein Mr. Kaliski has ignored applicable confidence intervals and estimated accuracies. The Concawe adjustments – the meteorological adjustments used within the Cadna-A ISO 9613-2 model for Mr. Kaliski's adjusted model – has similar confidence interval issues that Mr. Kaliski failed to include in his model results, and ignored in his discussion. The Concawe model document – provided by Mr. Kaliski in discovery and submitted as ALB-Cross-19 – on page 28, shows that there is a 95% confidence limit for the model, and the table found on that page shows that for each meteorological category there is a confidence interval that ranges from 4.5 to 6.9 dBA. ALB-Cross-19 at 28. Mr. Kaliski testified that his analysis used all 5 of the meteorological categories for the multiple model runs he performed, yet he failed entirely to address these confidence intervals. Kaliski, Feb. 22 at 122. Therefore, according to the Concawe document that Mr. Kaliski relied on and provided in discovery, it is quite possible for his results to be off by as much as almost 7 dBA, but certainly by 4.5 dBA, depending on which meteorological category was used to show the worst-case results. His results therefore clearly do not show a true worst-case scenario pursuant to this model.

In addition, on page 29 of the Concawe document, the authors state that this model is not very accurate for predicting the sound level at a certain place, since the "sound level would be influenced by parameters not contained in the model," which as they state is reflected in the "considerable standard deviation of measured sound levels, even for a fixed measuring location."

ALB-Cross-19 at 29. Mr. Kaliski, however, has used this model specifically to predict the sound level at certain places – the homes that may be most impacted as shown in tables 6 and 7 on page 30 of his report, KHK-2.

Further, the Concawe document specifically states that the model has only been validated "for wind speeds of up to 7 meters/second. Any extrapolation beyond these ranges should be done with caution." ALB-Cross-19 at 43. Mr. Kaliski used the model to predict noise at wind speeds well in excess of 7m/s, and failed to address how the results could be reliable given that the model specifically states it was not intended or validated for this purpose.

This suggests that the results of the model are potentially inaccurate, and at the very least the Board needs to take into account the confidence intervals that the model itself defines, which shows that the results must be increased by 4.5-6.9dBA (just for the Concawe adjustment) to ensure accurate estimates of noise. When you add to this the 3dBA confidence interval inherent in the ISO 9613-2 model as discussed above, which is the base model into which the Concawe adjustments are added, the confidence interval becomes 7.5-9.9, and we can begin to see exactly how inaccurate this model is, and how dangerous it may be to rely on it for an issue so important as public health.

There are various other issues that suggest the Concawe adjustments may be underestimating the actual sound pressure levels that will be experienced in the vicinity of the Project.[32] This model, as with the base ISO 9613-2 model within which the Concawe

[32] There are also issues concerning the data used in the model that may not have been accurate, but where it remains unclear exactly how the model is affected. An example of this is on page 29 of Mr. Kaliski's report, which states that the adjusted model used cloud cover data from the "nearest weather station" which the report claims to be the Barre/Montpelier airport 50 miles away. Mr. Raphael, however, for his aesthetics analysis used cloud cover data from Morrisville, VT which is only 20 miles from the Project. Not only is the Barre airport far from the Lowell Mountains, it is lower in elevation and topographically very different, since it is a wide open flat area (necessary for an airport) rather than a ridgeline, which can

adjustments are made, is only valid for sources of much lower height than the proposed Project, and is based on temperature and wind measurements taken at no more than 11 meters in height. ALB-Cross-19 at 16. The Concawe model was in fact created to model noise from petrochemical plants, and was validated for three specific plants, the sources of noise from which were no more than 25 meters in height, and these plants were on flat terrain. ALB-Cross-19 at 13-14. The proposed turbines, at around 85 meters at hub height and on a ridgeline in a topographically complex area, are well outside of the intended and validated use of the Concawe model. Kaliski, Feb. 22 at 117-118.

This difference in height is important for two reasons, both of which call into question the accuracy of the model. First, the Concawe document explains that the meteorological component of the model was based on data collected at 1 meter and 11 meters above the ground, and adds that "whilst this can only indicate the variation in temperature with height close to the ground, it has been shown empirically that, for the distances being considered, it is the first 30 meters of the atmosphere which affects noise propagation." ALB-Cross-19 at 16. While this may be the case for noise sources that are under 25 meters in height, such as the petrochemical plants on which the Concawe Model are based, it is clearly not the case for wind turbine noise. In fact, the authors on Concawe specifically state that "data with respect to barrier effects, effects of source height, and in-plant screening is more limited, and further work is needed on these aspects." ALB-Cross-19 at 2 (emphasis added). Thus even the authors of the Concawe model acknowledge that the actual noise levels may vary from the model results when source heights are not within the range of the model's validated heights, which are all below 25 meters.

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be affected by orographic lifting and other meteorological concerns specific to mountains. So while there was better data available, Mr. Kaliski did not use it, and the ramifications of this remain unknown.

Mr. Kaliski himself has indicated how important height (or elevation) is to the noise that the wind turbines produce. In his report, he notes that "Meteorological conditions can significantly affect sound propagation. The two most important conditions to consider are wind shear and temperature lapse." PET-KHK-2 at 23. Mr. Kaliski then adds that "Wind shear is the difference in wind speeds by elevation and temperature lapse rate is the temperature gradient by elevation." *Id*. (emphasis added). It is therefore clear that elevation is crucial to the two meteorological conditions that Mr. Kaliski states can significantly affect sound propagation. Mr. Kaliski further admitted that wind shear may be different at different altitudes, ALB-Cross-12, and during cross examination he had no choice but to agree that the Concawe model, as set forth in the document Mr. Kaliski provided in discovery, does not account for the meteorological conditions at hub height for a wind turbine. Feb. 22 at 113. The results of Mr. Kaliski's modeling are therefore not an accurate representation of what may be experienced in the real world, since the model was not intended or validated for the height of the noise source at issue in this docket.

Mr. Kaliski has claimed that this model was validated for a wind farm; however the only validation that Mr. Kaliski provided, found at ALB-Cross-18, indicates that the facility was on flat farmland, and not a ridgeline facility such as the proposed Project.[33] While the results of Mr. Kaliski's validation suggest that the model was successfully applied to that facility, this is reasonable for a facility on flat land, where the terrain and grazing angles are closer to those used in the creation of the Concawe model as discussed above. This does not indicate that the model is defensible for the ridgeline facility proposed in this matter. Moreover, the validation was only

[33] Mr. Kaliski provided no other validation of the model for ridgeline facilities, even though he was asked in discovery to provide all of the sources he relied on for his testimony. Any claim that he has validated the model for other facilities should therefore be rejected, since he apparently did not actually rely on any validation other than the one provided at ALB-Cross-18.

done using monitoring at distances below 610 meters, whereas the receivers at issue in this docket are quite a bit further away, and Mr. Kaliski in fact states in the validation article that "Care should be taken in applying this methodology in other Projects that are not similar." ALB-Cross-18 at 13. Since this proposed Project is not at all similar in topography or distances between source and receiver to the validation performed by Mr. Kaliski, it remains unclear how accurate the model is, and how unreliable the results may be – especially where Mr. Kaliski has failed to calculate and account for the confidence intervals provided for the models as discussed above.

The difference in height between wind turbines and the petrochemical plants used as a basis for the Concawe modeling is also important because of the grazing angle. This is the angle between the source and receiver, created by the difference in elevation between them. For the petrochemical plants that Concawe is based on, the grazing angle is very low, with the plants used to verify the models having a grazing angle between source and receiver of 0-6 degrees. ALB-Cross-19 at 21. Once again, this is why only the first 30 meters of atmosphere is relevant for these lower sources, since the sound only propagates at these low angles, thereby avoiding any interaction with higher elevations. For this Project, however, the grazing angle is much higher, with the angle between the Project and the homes listed in tables 6 and 7 of Mr. Kaliski's report being around 12-18 degrees. Feb. 22 at 115.

Besides the fact that this creates a very different angle at which the noise will propagate, and the elevations at which noise will be affected as discussed above, this higher grazing angle is important for how the model deals with something called ground effects. Ground effects are used in the modeling to take into account the ground's ability to attenuate sound – to absorb, scatter or reflect it. Mr. Kaliski testified that the model results he has provided in tables 6 and 7

of his report did take into account ground effects, and that this would have reduced the dBA at these properties by as much as 3dBA. Feb. 22 at 125.

Mr. Kaliski, however, either failed to notice or has ignored the Concawe model document, which specifically states that where the grazing angle is greater than 5 degrees, the ground effects should be zero. ALB-Cross-19 at 11.[34] Since Mr. Kaliski readily admitted that the grazing angles at issue in this case are well above 5 degrees, it was improper for him to include ground effects in his model, and the results must be increased by 3dBA to be consistent with the Concawe parameters.

It is therefore clear that the results of Mr. Kaliski's modeling must be modified to take into account the estimated accuracy and model parameters that the authors of the models themselves state are inherent in these models. The +-3dBA confidence interval for the base ISO 9613-2 model, the +-4.5-6.9 confidence interval for the Concawe adjustments used within that ISO model for the adjusted modeling, and the 3dBA that must be added to the results to account for the mistaken use of ground effects when Concawe specifically states they should be zero, when taken together suggest that the results of Mr. Kaliski's modeling may under estimate noise by 10.5-12.9dBA.

The confidence intervals ignored by Mr. Kaliski suggest that his modeling did not provide the worst-case scenario, and it is simply not credible for him to claim that the modeling was conservative. These confidence intervals are set forth by the creators of the models and are contained right in the documents that Mr. Kaliski provided in discovery. Since the results of Mr. Kaliski's models suggest that noise levels, without these adjustments, would be very close to the

[34] This is consistent with Mr. Kaliski's statement in his article Propagation Modeling Parameters for Wind Power Projects, wherein he stated that the ISO 9613-2 model underestimated sound levels, potentially due to "the height of the hub (80 m) as compared with typical noise sources. That is, the sound waves may not significantly interact with the ground over that distance…." ALB-Cross-18 at 1 (emphasis added).

45dBA standard, the Board cannot find that the Project would comply with that standard once the relevant and applicable confidence intervals are included in the results.

There is yet another inherent inaccuracy in the modeling that results in an underestimate of the noise levels that may be experienced at neighboring residents. The sound power of the turbines that was used for the modeling, which was provided by the manufacturer and not independently verified, is not accurately portraying the sound power that may actually be experienced at higher wind shear conditions. The higher sound power levels that will be experienced during high wind shear conditions will increase the noise by as much as 5dBA, and perhaps even more, suggesting, yet again, that Mr. Kaliski's results do not portray a true worst-case scenario.

The sound power of the turbines is calculated by the manufacturer by taking measurements of sound pressure and intensity during tests of the turbines under certain specified conditions. These calculations, however, are based on conditions that underestimate the worst-case sound power, since the tests are performed to the IEC 61400-11 standard, which calls for testing under conditions of a neutral atmosphere, with a wind shear exponent of 0.16. James, Jan. 24 at 4-5. A neutral atmosphere means that the wind speed increases gradually in a logarithmic gradient that starts very close to the ground at zero and increases in a uniform manner as one moves up from the ground to the height of the turbine blades. *Id.*

This weather condition produces the lowest sound emissions from wind turbines. Both the steady aerodynamic sounds and any blade swish are at their minimum in these conditions. This is because the difference in wind speed for the turbine's blade at the bottom and top of the rotation is small enough that the blades can be set for an optimum angle of attack for all wind speeds encountered over the rotation. This is incredibly important, since the sound power of the

turbine that is plugged into the model is only valid for a wind shear of 0.16, it does not indicate the sound power level at higher wind shears, and the model may therefore underestimate resulting noise levels.[35] James, Nov. 22 pf. at 4, Jan. 24 pf. at 4-6.

This is due to the fact that during the nighttime, high wind shear conditions can make the wind speed the blades encounter at the bottom of the rotation much less than the wind speed at the top, which causes the blades to be inefficient and inefficiency results in noise. While Mr. Kaliski's adjusted model may have modeled the noise of the turbines during high wind shear – which is necessary because high wind shear provides one of the worst-case scenarios of turbine noise – he only modeled the refraction and attenuation of the sound during these conditions, and the sound power level that was used in the model was not adjusted for the high wind shear condition (i.e. Mr. Kaliski only used the manufacturers sound power data based on neutral atmospheric conditions (0.16 wind shear), even for scenarios with higher wind shears). There is no data for any of the proposed turbine models showing the sound power levels during other atmospheric conditions such as a stable or unstable atmosphere. James, Nov. 22 pf. at 6.

In discovery Mr. Kaliski provided Van Den Berg's thesis "The Sounds of High Winds," which he relied on for his testimony. In that paper, the author notes that:

> in a stable atmosphere a wind profile can be very different from the logarithmic, neutral profile and the hub height wind velocity is higher than predicted by the neutral profile. As more wind at hub height makes a variable speed wind turbine rotate at a higher speed, the sound power level may be significantly higher in a stable atmosphere at the same wind 10-m velocity V10 (which usually occurs when the sun is down and no strong near-ground wind is present).

[35] While Mr. Kaliski repeatedly referred to this as a "guaranteed sound power," since the sound power level data provided in discovery specifically states that it is based only on a wind shear exponent of 0.16, it follows that the sound power levels are only guaranteed under those wind shear conditions. There is no evidence suggesting that the guarantee is applicable to higher wind shear conditions, or is even enforceable against the manufacturer should the testing prove inaccurate.

ALB-RJ-6 at 141.[36] This increase in the sound power level in a stable atmosphere, when wind shear conditions persist, is more common at night, and therefore has very real potential to increase noise levels when people are trying to sleep. In those conditions, the turbine cannot set the blade at the most advantageous angle of attack for the wind speed at the top and bottom of the rotation, since the blades are not able to adjust independently, and the turbines only have one anemometer, located at the hub, so the turbine cannot even know what the difference in wind speed is at the top and bottom of the rotation. Kaliski, Feb. 22 at 85.

As Van Den Berg notes, when the angle of attack is off by a certain number of degrees, it causes the blade to move through the air inefficiently during part of its rotation, which can cause the blade swish effect, and increase noise. Mr. Van Den Berg, in the appendix to his paper, provides a table that shows the degree to which the blade may be off of the most efficient angle of attack, and the corresponding effect on the sound power. ALB-RJ-6 at App. B-5. According to Van Den Berg, during high wind shear conditions, when the angle of attack cannot be optimal, the sound power level can be anywhere from just a slight bit higher (1-3dBA), to as much as several dBA higher (up to 11dBA), depending on how off the angle is. Since the sound power levels of the turbines, provided by the manufacturer, are based on low wind shear conditions, they are not accounting for this increase in sound power during high wind shear. Therefore, they do not show the worst-case sound power levels that Van Den Berg shows can be several dBA higher during high wind shear conditions.

If the turbine sound power data that Mr. Kaliski used in his modeling was not based on the sound power of the turbine in high wind shear conditions, then the modeling would not

[36] Mr. Kaliski testified that he relied on this author and this paper in forming his opinions and testimony. Feb. 22 at 87.

provide a worst-case scenario regarding turbine noise. It follows that even if the model was used to predict the noise at a nearby home during high wind shear conditions, since the sound power data put into the model does not reflect actual sound power during those conditions (i.e. is lower than worst case), the results will not show worst case conditions. Mr. Kaliski did not perform the necessary calculations for each of his models meteorological conditions to determine by what degree the angle of attack may be off by (even though it is possible to model the angle of attack),[37] so we are left to wonder what changes in sound power should have been applied.

Based on Mr. James' testimony, and the findings of Van Den Berg, it is reasonable to assume that sound power levels and the noise experienced in the vicinity of the Project would be at least 5dBA higher than Mr. Kaliski has indicated during high wind shear conditions. James, Nov. 22 pf. at 6-7. Because the results provided by Mr. Kaliski's models indicate that the margin of safety for noise from this Project is very slim, with several residences right on the line of experiencing noise levels at the 45dBA standard (which again is not supported by the literature as being protective of public health), the night time conditions will likely not meet even this standard when the wind shear is above 0.16 and sound power levels increase.

Albany must also note that while Mr. Kaliski has claimed that the Project site does not experience very high wind shear conditions, the wind shear data provided in his November 22 testimony is somewhat misleading. The table provided on Page 13 of his testimony suggests that average wind shear is between 0.15 and 0.20, but the 90th percentile data shows that wind shear does get up into the .30-.40 range, indicating that at least 10 percent of the time the site has high

[37] As is shown in the following:

> Q. So you didn't do anything to account for this, to analyze whether the angle of attack could or would be off by any of these degrees at any time?
> A. No. We haven't done an angle of attack model.

Kaliski, Feb. 22 at 94.

wind shear conditions. Note that the higher wind shear numbers are during the nighttime and very early morning when people are trying to sleep. Additionally, this data is taken from the met towers located on the Project site; however the met towers are only 164-262 feet in height, as opposed to the turbine blades, which reach up to 450 feet. *See* Docket 7558 Order of 2/8/10 at 6. Since not all the met towers are even measuring wind at hub height, and do not allow for anemometer readings at various elevations, including at the top of the turbine blade rotation, and since even Mr. Kaliski has stated that wind shear is the difference in wind speeds by elevation, and that wind shear may be different at different altitudes, it follows that the results provided by the met towers regarding wind shear may not be entirely accurate.

After taking into consideration the confidence intervals Mr. Kaliski ignored for the models he performed, the ground effects that should not have been left out based on the grazing angle, and the inaccuracies of the sound power levels discussed above, it is clear that the modeling results provided by GMP are inaccurate, biased, and do not support the contention that the Project, as currently designed, will meet even the 45dBA standard. It would be irresponsible of the Board to rely on Mr. Kaliski's analysis when he has ignored the confidence intervals for the models, and when factored in they indicate that the Project would not meet the 45dBA standard. This Project therefore poses a risk to public health, and a CPG cannot be issued.

ii. The Board should not allow GMP to rely on NRO mode to meet the standard.

Findings:

67. Two of the turbine models that GMP proposes to use for this Project would need to be operated in a noise reduction mode (NRO) in order to meet a 45dBA exterior standard. Kaliski, Nov. 22 at 26-28.

68. The NRO mode would be used during certain meteorological conditions to reduce the noise produced by certain turbines; however none of this has been defined and it is not clear when, where or even exactly how NRO mode would be employed. *Id*.

69. No other Projects in Vermont have required the use of a noise reduction mode to meet the relevant noise standard.

70. The petitioner has not provided adequate information to prove that NRO mode would be capable of reducing noise sufficiently to meet the 45dBA standard.

71. Turbines operating in Maine that utilize NRO mode have not shown a reduction in nighttime noise levels since NRO mode has been used. James, Jan. 24 pf. at 8-9; Feb. 23 at 34-35.

72. If NRO mode is required to meet the standard according to the modeling, it may then not be possible to reduce noise further if it turns out the modeling was incorrect, and then turbines might need to be shut off during certain meteorological conditions to maintain the noise standard. Kaliski, Feb. 22 at 104.

Discussion:

GMP has yet to decide which type of turbines they would use for the Project, however two of the possible models would need to operate in a noise reduction mode (NRO) to even meet the 45dBA standard. There are several problems with this. First is that by operating the turbines in NRO mode just to meet the 45dBA standard, the Project loses a margin of error regarding noise impacts. The NRO mode provides a safety valve, so to speak, regarding potential noise emitted by the Project. If the modeling indicates that the noise at a certain house would be 43dBA (w/out NRO), and the standard is 45dBA, then there is some room for error. If it turns out that the modeling was off by several decibels, and the house is experiencing 47dBA at night during periods of higher wind shear, and therefore the noise standard is not being met, then the NRO mode could be employed to get those turbines contributing to the violation down into levels that meet the standard.

If, however, we know from the outset, from the modeling, that the turbines would not meet the standard without the NRO mode, then we have lost that safety valve. In other words, if the modeling shows that the noise level would be 44dBA with the NRO mode on (in certain conditions) and if it then turns out that the modeling was off by a few decibels, and that same house was experiencing 47dBA (or higher), then we do not have that NRO mode to fall back on. The result, as Mr. Kaliski explained, would be to require certain turbines contributing to the noise violation to be shut down during specific meteorological conditions, which would certainly impact the economic benefits of the Project. Kaliski, Feb. 22 at 104. This should not be allowed, and can only be rectified by proactively siting the turbines to ensure that the applicable standard would be met even without NRO.

The other issue is that we have been given no indication that NRO mode would in fact be able to achieve a sufficient reduction in noise levels to protect the public that may otherwise experience undue adverse impacts from the noise. The petitioner provided no study that has compared turbines operating in NRO mode with the noise levels absent the NRO function. Mr. James, on the other hand, has firsthand experience with turbines operating in NRO mode, and his testimony indicates that the NRO mode may not in fact reduce the noise experienced by those living in the vicinity of the Project. While Mr. James' testimony, comparing daytime noise without NRO to nighttime noise with NRO at a facility in Maine, did not fully explain his experience with NRO, he clarified during the hearings that the nighttime noise levels experienced at the facility have not diminished since NRO was put into use. James, Jan. 24 pf. at 8-9; Feb. 2 at 44-46.

As Vermont has no experience with turbines with NRO mode, and whereas the only testimony regarding the adequacy of NRO mode at an actual facility suggests that it may not

reduce noise at night (when amplitude modulation during higher wind shear can increase noise levels by 5-10dBA), the Board should place little confidence in the ability of NRO mode to protect neighbors from levels exceeding what even GMP's experts agree to be levels that will cause adverse health impacts. There is simply no reason to expose the public to this type of risk, and no basis for the Board to allow noise levels that may cause the health impacts that have been linked to annoyance and sleep disturbance from wind turbine noise.

The Board further cannot rely on monitoring to ensure that NRO mode is working, since at that point it is too late to move the turbines further from the neighboring homes. These matters must be dealt with prior to construction, and whereas the petitioner has not met its burden to show that NRO mode can be relied on to protect the public from turbine noise that GMP admits would otherwise be in violation of the 45dBA standard, it would not be in the public good to allow this Project to risk the health of the neighboring public, and therefore the Board must not allow GMP to utilize these noisier turbines, or they must be sited to meet the applicable standard without NRO mode.

iii. The petitioner is unjustifiably relying on 15dBA attenuation by structures to ensure that a 30dBA interior standard is met.

Findings:

73. The noise standard the Board has used in previous cases stated that noise could not exceed 30dBA averaged over an hour in the interior of neighboring residents.

74. Maintaining a level of 30dBA or below in the bedroom is necessary to protect healthful sleep. Irwin, Feb. 24 at 62.

75. The attenuation of sound by structures from outside to inside varies based on the construction of the house, its age, the quality of the windows, and numerous other factors. McCunney, Feb. 10 at 165; Irwin, Feb. 24 at 55-56. Older homes, homes with less insulation and homes with their windows wide open may not be able to attenuate sound by 15dBA. *Id*.

76. Although a standard wall in a home may be able to block 10-15 dBA of the outdoor noise it does not block the effects of the infra and low frequency noises. These will pass through the walls and roofs of homes with little attenuation. Field tests of this have shown that reductions of only about 6 dB occur when using the C-weighting which includes the low frequency sounds omitted in dBA measurements. James, Oct. 22 pf. at 19.

77. The petitioner has only provided modeling results for the noise levels that may be experienced at the exterior of neighboring homes, and is assuming 15dBA of attenuation to meet the 30dBA interior standard. PET-KHK-2 at 7.

78. The 15 dBA attenuation assumption comes from the WHO, and is based on windows being "slightly open." ALB-RJ-5 at XVIII of executive summary.

79. People should have the right and ability to sleep with their windows entirely open, or even outside their homes without suffering undue adverse health impacts from noise. Irwin, Feb. 24 at 56.

80. The expected attenuation, when measured at the center of a room, with windows wide open would be on the order of 7dBA. Blomberg, Oct. 22 pf. at 6.

81. It is possible to test for the sound attenuation of structures, using the ASTM E966-04 outside to inside level reduction test. This has been included in the Sheffield monitoring plan, to be used to determine whether Project is complying with the noise from the Project during the post-construction monitoring. It may also be used to determine whether the pre-construction modeling results provided by the petitioner would meet the 30dBA interior standard. DPS-Cross-6.

Discussion:

As Dr. Irwin testified, the focus for protecting sleep is maintaining levels in the bedroom that would not exceed 30dBA, as set forth by WHO. Irwin, Feb. 24 at 55. The standard previously used by the Board specifically addresses this, calling for 30dBA to be maintained in the bedroom.[38] Mr. Kaliski testified that monitoring noise levels inside neighboring residents homes is intrusive and therefore GMP has only modeled the exterior noise levels, and is

[38] This is averaged over one hour, which as explained above would not be protective of public health since noise levels could easily exceed the instantaneous 32dBA level that WHO found to cause sleep disturbance. *See* footnote 6.

assuming that sound will be attenuated by 15dBA by the structure of the home, thereby maintaining a certain level in the bedroom.[39]

This, however, is a dangerous assumption, and it does not ensure that noise levels will in reality be kept below the 30dBA target for bedroom noise. The assumed 15dBA attenuation is taken from the WHO report; however the report specifically states that this is the potential attenuation with the windows "slightly open." ALB-RJ-5 at XVIII of executive summary. Dr. Irwin agreed, as any reasonable person would, that it is a reasonable expectation that people may want to sleep with their windows completely open, which would certainly impact the ability of the house to attenuate sound. Depending on the orientation of the windows and their size, it may very well be that sound would not be attenuated by 15dBA when windows are fully open, but would only be attenuated by 7dBA, and in the case where the bedroom is the nearest room to the noise source, a 45dBA standard at the exterior would not ensure that the 30dBA standard would be met in the bedroom.

Furthermore, both Dr. McCunney and Dr. Irwin agreed that the ability of a structure to attenuate sound is not consistent, but rather is dependent on the building materials and insulation of the home, as well as the age of the home. GMP has made no assessment of the actual homes in the vicinity of the Project, and whether they would in fact be able to attenuate noise by 15dBA, even with the windows closed. Certainly the camps in the area – which for some reason were ignored completely by Mr. Kaliski in his analysis even though people visit those camps regularly to enjoy the peace and quiet of the outdoors, and in which people sleep – are older

[39] Kaliski Nov. 22 pf. at 25.

structures made from logs and timber framing,[40] and since they are used as camps may not have the same level of insulation as the homes WHO had in mind when they assumed 15dBA attenuation. Similarly the full-time residences in the area may very well be several decades old, if not older – such as the Nelson home which is on the state register of historic homes as having been constructed circa 1810 – and the materials and insulation used in these homes may provide less attenuation than the 15dBA assumption. PET-LP-1 at 14.

It would not, therefore, appear prudent to assume that any of the homes in the vicinity of the Project that are old or may have been constructed with less insulation, would actually be able to reduce noise by 15dBA, even with the windows slightly open, much less with them wide open. Which brings us back to the statement made by Mr. James, that there is no reason to use a standard that allows noise right at the levels at which adverse health impacts are likely to be experienced. If it is possible, and even likely, that sound will not be attenuated by 15dBA by some homes, and that people living in the vicinity should have the ability to sleep with their windows wide open, then to err on the side of caution we should only assume 10dBA attenuation (at the most – or 7dBA per Mr. Blomberg's testimony), in order to ensure that to 30dBA bedroom standard is going to be met. This would require meeting a lower exterior standard than this Project, as currently designed, is able to meet, and therefore the Project would have to be redesigned to meet a more appropriate standard.

The alternative is to conduct testing on the homes in the vicinity of the Project that have the highest risk for experiencing noise levels approaching the 45dBA level. While Mr. Kaliski believes this may be intrusive, he should be aware, since he was involved in the Sheffield case,

[40] See i.e. PET-KHK-2 Figure 17 at P. 21 depicting hunting camp, at which Mr. Kaliski took background sound measurements, but for some unknown reason failed to include in his tables discussing the results of his model.

that the Board has previously required testing of the attenuation of homes in the vicinity of the Sheffield Project as part of the monitoring plan in that Docket. DPS-Cross-6 at 3.

Albany believes that to be protective of public health, this testing needs to occur where people actually sleep, rather than the averaged center of room locations from the ASTM standard;[41] at the very least, however, the petitioner should be required to conduct the appropriate outside to inside level reduction (OILR) test, using the procedures set forth in ASTM E966-04, as was required in the Sheffield monitoring plan. GMP appears to want to avoid having to conduct these measurements, stating that "because measuring outside to inside reduction is intrusive, it will only be done at a complainant location and only with the permission of the homeowner. A standard such as ASTM E966-04 will be used. Absent that, a 15 dB reduction will be assumed." Kaliski, Nov. 22 Pf at 26. This is belied by the monitoring plan adopted in the Sheffield case, which suggests that the Board would rather rely on actual testing than assumptions which may not be sufficient to protect public health.

As discussed above, the assumed 15dBA of attenuation – which comes from the WHO report – may not be adequate for older or poorly insulated structures, and is based on the windows being "slightly open" as opposed to fully open. Relying on this assumption is therefore not recommended, and the Sheffield monitoring plan does not allow for this assumption, and specifically acknowledges that the "site specific test using the ASTM standard thus does not rely on a generalized attenuation factor such as that utilized in the WHO guidelines." DPS-Cross-6 at 3 fn. 2. Furthermore, the Sheffield monitoring plan states that the OILR test "will be performed under both windows open and windows closed conditions…." This is needed to ensure that the

[41] Mr. Kaliski even admits that there are locations within a room, particularly with windows opened, where the actual exterior to interior noise level reductions are less than those reductions derived by the ASTM E966-04 standard. *See* Blomberg, Jan. 24 pf. at 17.

structures are in fact able to attenuate noise enough to maintain the 30dBA interior standard during all conditions.

Albany believes that in order to ensure that the Project would not create unsafe levels of noise inside neighboring homes, this testing should be been done as part of GMP's application and analysis of the noise impacts of the Project. Since the Board apparently does not rely on the 15dBA attenuation set forth in WHO, but rather required the ASTM E966-04 testing for attenuation in Sheffield, the Board has acknowledged that different homes may attenuate noise at different levels – especially with the windows closed and open. Mr. Kaliski's analysis, however, only provides exterior noise levels, ignoring the interior standard that the Board has also used for wind Projects.

Albany believes that the ASTM testing must be used to ensure that the interior standard would be met prior to the issuance of a CPG, and not merely as part of the monitoring plan. GMP could have assessed compliance with the 30dBA interior standard, based upon the exterior noise levels that were modeled, and the results of the OILR test for the homes in the vicinity of the Project. This testing could easily show that where the 45dBA standard is just barely met (*see i.e*. the Lmax results in tables 6 and 7 of Mr. Kaliski's report), a 30dBA interior standard may not be met if the OILR testing indicates less than a 15dBA attenuation. Since the focus of the noise standards is protection of sleep, this is vital information in assessing the noise impacts of the Project to neighbors.

The Board should therefore require that the ASTM E966-04 testing be conducted for the locations listed in tables 6 and 7 of Mr. Kaliski's report, and the results be used to show whether

the 30dBA interior noise standard would be met for this Project.[42] A CPG cannot be issued until such testing is done to ensure that a protective interior noise standard would be met, and the parties must have the ability to review and comment on the testing procedure and results.

D. The Board should use a property line standard to protect the interests of neighboring landowners.

Findings:

82. It reasonable for a landowner to have the expectation that adjacent uses would not cause conditions anywhere on their property that could have an undue adverse health impact or an undue adverse impact on the character of the area. Kaliski, Feb. 22 at 100-101; Blomberg, Jan. 24 pf. at 9-10.

83. The maximum noise level should be applied at the property line rather than at residences because property owners have the right to construct dwellings within 50 feet of their property lines. Allowing a higher noise level at the property line takes away that right. It also means that the applicant will be using other people's private property to attenuate the noise levels from the turbines, a fundamentally unfair proposition. Blomberg, Jan. 24 pf. at 10.

84. A person of average sensibility would feel that noise emanating from a neighbor that interferes with that person's sleep inside his or her own house is highly offensive.

85. GMP is using the neighbors' land, land they do not have permission to use, as a "buffer" against the noise and other health and safety effects. Focusing on the residence instead of the property line is a defacto granting of a noise pollution easement to GMP without the consent of, or compensation to, the property owner. A property line standard could prevent this. Blomberg, Jan. 24 pf. at 9-10.

Discussion:

Albany agrees with the testimony provided by Mr. Blomberg on behalf of LMG calling for a standard based not on the noise level at the neighboring residences, but at the property

[42] Of course, the analysis must be based on the modeling results, which currently do not take into account the applicable confidence intervals, as discussed above. Therefore, the Board must also require GMP to evaluate compliance with the 30dBA interior standard based on revised modeling results that take into account the issues discussed above that resulted in the under-estimation of exterior noise levels.

lines. Using a standard measured at the structure is unfair to property owners, whose property is then being used as a noise buffer without their consent. Even GMP's experts agree that noise levels over 45dBA would pose concerns regarding annoyance and sleep disturbance, and since noise at that level would be 15dBA or more over background levels would be out of character with surrounding land uses. The results of Mr. Kaliski's model, even without taking into account the inaccuracies discussed above, show that noise levels will exceed 45 dBA on substantial portions of neighboring properties.

By allowing the petitioner to produce noise on an adjoining property that would exceed the levels at which health problems are certainly an issue, the Board would be removing the ability of the landowner to develop that land for other purposes, such as additional homes.[43] While this may not rise to a taking of the land, it may rise to the level of a nuisance, and it unfairly restricts and impairs the use and enjoyment of neighboring properties in violation of not only the law of nuisance, but the basic societal ethics of not using your property in such a manner as to harm those around you.

This is even more important for this type of Project, which can and will operate at any and all hours of the day and night. There is little by way of comparison regarding other developments. Even if a lumber operation or a quarry were to be developed in the area, and noise were to then be emitted through the use of adjacent property, the noise would be restricted to daytime, when sleep disturbance is not an issue. For the reasons set forth by LMG and Mr. Blomberg, a standard at the property line is warranted, and such a standard would also ensure that the noise levels were kept below levels that would cause adverse impacts at the neighboring homes.

[43] Kaliski, Feb. 22 at 100-101.

E. The petitioner has failed to provide an actual monitoring plan, and what they have suggested for noise monitoring is entirely inadequate.

Findings:

86. The Petitioner has not submitted a monitoring plan for this Project. A monitoring plan must be developed to ensure that the standard is being met, and the public is protected from adverse health impacts.

87. Mr. Kaliski provided some bullet points for a monitoring plan; however the components he described would be insufficient to protect the public health, and would be significantly less comprehensive than the plan approved by the Board in the Sheffield case. Kaliski, Nov. 22 pf. at 24-26; Feb. 22 at 14-28.

88. Mr. Kaliski's testimony calls for two periods of monitoring, once during late fall and once during late spring to early fall in the year following the start of commissioning of the facility – for as little as one week for each of the two periods. Kaliski, Nov. 22 pf. at 24-26.

89. The Sheffield monitoring plan provided for four rounds of monitoring, covering every season, and required two full weeks of data collection. DPS-Cross-6 at 2.

90. With only two weeks of monitoring, it will remain unclear whether that standard is in fact being met for any given hour during which monitoring is not taking place, or for meteorological conditions not covered by the monitoring period.

91. The outline provided by Mr. Kaliski states that "beyond five years after construction, if no exceedances are found in that time, complaints will only be addressed if they relate to malfunctions or maintenance issues at the wind farm." Kaliski, Nov. 22 pf. at 26. This is unwarranted and insufficient to protect the public.

92. A monitoring plan must include monitoring for infrasound, and include outside inside level reduction testing (in compliance with ASTM E966-04) to ensure compliance with an interior noise standard.

Discussion:

Regardless of what standard the Board uses in this matter, a monitoring plan must be developed to ensure that the standard is being met, and the public is protected from adverse health impacts. It is astonishing that GMP has not provided a monitoring plan for this Project, and expects the Board to rule on a Certificate of Public Good when a plan to ensure something as

important as the public's health has not been submitted. Albany believes this to be a grievous oversight, and this failure demonstrates GMP's disregard for the burden they have to provide sufficient information in this matter. The Board cannot issue a CPG unless and until a proper and sufficient monitoring plan is developed, and the parties must have the opportunity to review and comment on a monitoring plan if and when one is submitted.

While Mr. Kaliski did provide an outline of a monitoring plan, the components he described would be insufficient to protect the public health, and would be significantly less comprehensive than the plan approved by the Board in the Sheffield case. For example, the outline provided by Mr. Kaliski suggests that monitoring take place only twice – once during late fall and once during late spring to early fall in the year following the start of commissioning of the facility – for as little as one week for each of the two periods. Kaliski, Nov. 22 pf. at 24-26. While Mr. Kaliski claims that this would "establish sound levels during various meteorological conditions," it would not cover all of the potential meteorological conditions experienced in the area throughout the year, since only two seasons would be covered, and potentially only 2 of the 52 weeks of the year. *Id.*

It remains unclear how GMP will ensure that these two weeks are truly representative of the meteorological conditions in the area the remainder of the year, and therefore what the noise levels experienced by neighbors may be at other times. It is important to note that the Sheffield monitoring plan provided for four rounds of monitoring, covering every season, and required two full weeks of data collection as opposed to the "one to two weeks of monitoring" suggested by Mr. Kaliski for this case. DPS-Cross-6 at 2.

It is also unclear how two weeks of monitoring during only two seasons will ensure that an hourly standard is met. The Board has previously used, and will likely continue to use, a

standard that requires the noise to remain below a certain level averaged over an hour. With only two weeks of monitoring, it will remain unclear whether that standard is in fact being met for any given hour during which monitoring is not taking place. The information obtained by this monitoring would need to extrapolated to assess whether the standard is being met throughout the year; however this is dangerous since, as discussed above, certain weather conditions such as high wind shear can drastically alter the noise levels.

The Board should further require that the monitoring include infrasound measurements (down to 1 hertz), to ensure that infrasound is not reaching levels that may cause adverse impacts. The plan should also require outside to inside level reduction testing following ASTM E966-04 procedures as set forth in the Sheffield monitoring plan, and discussed further above, to ensure that the interior noise standard is being met. A more robust plan is needed to ensure that the standard is in fact being met, and people are not experiencing noise levels that are unsafe.[44]

Finally, the monitoring plan must provide for a fair and reasonable means for complaint resolution. The outline provided by Mr. Kaliski states that "beyond five years after construction, if no exceedances are found in that time, complaints will only be addressed if they relate to malfunctions or maintenance issues at the wind farm." Kaliski, Nov. 22 pf. at 26. This is unwarranted and insufficient to protect the public, since noise levels may increase as the turbines age and conditions change at the site.

A monitoring plan for this Project must at least provide the same levels of protection that were set forth in the Sheffield docket, and there appears to be no justifiable reason for GMP to suggest such a weakened version of what this Board has required in prior dockets. As an adequate plan has yet to be developed, the Board cannot issue a CPG for this Project.

[44] This is especially important if the Petitioner uses turbines that must be operated in NRO mode.

III. THE PETITIONER HAS FAILED TO ADEQUATELY ADDRESS THE AESTHETIC AND ECONOMIC IMPACTS OF THE PROJECT.

A. GMP's aesthetics analysis is biased, flawed and fails to consider the impacts of the Project from Craftsbury.

Findings:

93. The Project does not fit within the character of the area in which it is proposed, and therefore would have an adverse impact on the aesthetics of the area. There is no dispute among the experts in this case that the Project will have an adverse aesthetic impact on the area.

94. The east side of the Project - Albany and Craftsbury - is generally more open with more traditional village settlement patterns," and "are more pastoral, with significant areas of open pasture, meadow and farm land." Kane, Oct. 22 Pf. at 6; DPS-MK-2 at 9.

95. "Because Lowell Mountain is so prominent within its landscape, it commands a relatively large viewshed," and that the areas east of the ridgeline have a higher probability for views, because of its less topographically varied and more open terrain. *Id* at 6-7.

96. The area to the east of the Project site is recreationally developed with many tourist and guest accommodations including the Craftsbury Outdoor Center, Windridge Tennis Camp and Coachworks Farm. The areas in and around Hosmer Ponds are used for numerous recreational functions. *Id.* at 25.

97. "The Project is of a scale and form that is out of character with the existing visual context of the landscape." DPS-MK-2 at 28.

98. The *Quechee* test is concerned with the "fit" of a Project within its surroundings, which is a local concern, as evidenced by the 10-mile study area for the aesthetics analysis. There are no other such Projects in the vicinity of the proposed Project site, and therefore industrial wind facilities are absolutely not commonplace or an accepted development in the landscape.

99. DPS witness Mr. Kane undertook this site-specific analysis, he concluded that the Project would be shocking and offensive to the average person due to its effects on the Bayley Hazen road and surrounding area, and therefore the adverse impacts of this Project would be considered undue pursuant to the *Quechee* analysis. Kane, Oct. 22 at 10-11; DPS-MK-2 at 26-31. He further found that GMP has "not adequately addressed impacts to nearby residential and recreational areas." *Id.*

100. The Project would be shocking and offensive to the average person in Craftsbury and Albany. *See* attached letter from the Albany Selectboard.

101. GMP has failed to adequately address the impacts to the nearby residential and recreational areas within Craftsbury, and therefore GMP's analysis is incomplete. Kane Oct. 22 at 10-11; DPS-MK-2 at 26-31.

102. GMP failed to provide even one simulation of the Project as seen from Craftsbury. Mr. Kane agreed that GMP's failure to include a simulation from Craftsbury was an error/omission. Kane, Feb. 9 at 53.

103. The Craftsbury Town Plan, excerpts of which were provided by Mr. Raphael in Appendix 11 to PET-DR-2, specifically states that the Town's "visual beauty resides in its landscape," and that "Craftsbury is strongly defined by the north-south chain of the Lowell Mountain range to the west."

104. The impacts to Little Hosmer would be shocking and offensive, and have an unduly adverse impact on that public recreational resource.

105. Vermont Byways Program website state that "The best way to 'meet' Vermont is to get off its Interstate Highways and onto our secondary roads," and that public permitting, including Act 250, is concerned about views of proposed developments from public roads. Henderson-King Jan. 10 pf. at 2.

106. Mr. Pion, a selectman from Lowell, who testified that the Project would be visible from many of the roads in the area, and that many roads have prominent views and many people would see the Project from the roads in the area. Pion, Feb. 4 at 58-59.

107. Appendix 7 to Mr. Raphael's report: View from the Road, specifically states that "visibility is to the top of the ridge, and does not necessarily account for portions of the turbines that may be visible above ridgeline." It is therefore readily apparent that the map underestimates the visibility of the Project by ignoring the 400+ foot towers that would be placed on the ridge, which would certainly increase the visibility of the Project.

108. The Project would be visible from many major and secondary roads in the area, including large stretches of Routes 100 and 14, as well as several roads in Craftsbury that the Town believes to be significant vantage points for residents to experience the views of the Lowell Mountains. Henderson-King, Jan. 10 pf. at 1; DPS-MK-2 at 14.

109. Mr. Raphael has mistakenly claimed that the Project would not be visible from the Craftsbury Common, and has therefore failed to address the impacts of visibility from this public area. Henderson-King, Jan. 10 pf. at 3; Feb. 8 at 8-10.

110. "Craftsbury is known as a destination community attracting visitors in all seasons…. The stunning fall foliage juxtaposed against rolling fields and meadows with mountains to the west and east is sought after by visitors from near and far," and further added that "water related activities, such as boating, canoeing and fishing, as well as bike tours also draw people to Craftsbury in the summer and fall." Henderson-King, Oct. 22 at 4.

111. No such similar development exists anywhere within the vicinity of the proposed Project (especially the eastern side of the Lowell Mountains), and the ridgeline of the Lowell Mountains is certainly not the type of area in which one would expect to see industrial development. Rather, the area to the east of the Project is a rural-agricultural area, with gorgeous sweeping views of the Lowell Mountains, unmarred by any industrial elements, which is why Craftsbury specifically defines its aesthetic beauty by the views of the Lowell Mountains. *Id.* at 3-5.

112. As much as 25% of the study area would have visibility of the Project. Kane, Oct. 22 pf. at 6.

Discussion:

In determining whether a Project complies with 10 V.S.A. § 6086(a)(8) (criterion 8), as incorporated in this process through 30 V.S.A. § 248(b)(5), the Board applies the so-called *Quechee* Standards, developed in 1985 when the former Environmental Board sought to develop some objective criteria for evaluating the aesthetic impacts of proposed developments under Criterion 8. Under the *Quechee* standards, when evaluating a proposed Project's conformance with Criterion 8 the Board applies a two-part test. First, it determines whether the proposed Project would have an adverse effect on the aesthetics of the area, which is based on whether it will "fit" with the character of the area.[45] If the Board finds that the Project would have an adverse effect on the aesthetics of the area, it then determines whether the adverse effect would be undue. *See In re: Free Heel, Inc*., Docket No. 217-9-06 Vtec, Decision at 5 (Vt. Envtl. Ct.

[45] "In making this evaluation, the Board examines a number of specific factors, including the nature of the Project's surroundings, the compatibility of the Project's design with those surroundings, the suitability for the Project's context of the colors and materials selected for the Project, the locations from which the Project can be viewed, and the potential impact of the Project on open space." Re: Susan Dollenmaier and Martha Dollenmaier Spoor, Permit #3W0125-5-EB, Findings of Fact, Concl. of Law, & Order, at 11 (Vt. Envtl. Bd. Feb. 7, 2005).

Mar. 21, 2007) (citing *In re Quechee Lakes Corporation*, 154 Vt. 543 (1990); *In re Quechee Lakes Corporation*, Docket No. 3W0411-A-EB (Vt. Envtl. Bd., Nov. 4, 1985)).[46]

There can be little doubt that the Project does not fit within the character of the area in which it is proposed, and therefore would have an adverse impact on the aesthetics of the area. As Mr. Kane described it, "the eastern portion of the landscape, including the Town of Irasburg, Albany and Craftsbury, is generally more open with more traditional village settlement patterns," and "are more pastoral, with significant areas of open pasture, meadow and farm land." Oct. 22 Pf. at 6; DPS-MK-2 at 9. He adds that "Because Lowell Mountain is so prominent within its landscape, it commands a relatively large viewshed," and that the areas east of the ridgeline have a higher probability for views, because of its less topographically varied and more open terrain. *Id* at 6-7.

As Mr. Kane further described in his report regarding the *East Side of Lowell Mountain*:

> The landscape is more open and more pastoral. The villages are more traditional in form and more recreationally developed with many tourist and guest accommodations including the Craftsbury Outdoor Center, Windridge Tennis Camp and Coachworks Farm. The areas in and around Hosmer Ponds are used for numerous recreational functions. The landscape is also less topographically "rugged." With the exception of some intervening hills in Irasburg to the west of Route 14, much of the Black River valley is open with little topographic obstruction to views of Lowell Mountain. Certainly the pattern of woods influences visibility, but this viewshed has more inherent capacity for views of the Project. The viewshed analysis completed by Landworks appears to support this assertion as well.

[46] An adverse effect is considered "undue" if the Board answers any one of the following three questions in the affirmative: "(1) does the Project violate a clear, written community standard intended to preserve the aesthetics or scenic, natural beauty of the area; (2) does the Project offend the sensibilities of the average person; and (3) has the applicant failed to take generally available mitigating steps that a reasonable person would take to improve the harmony of the proposed Project with its surroundings." *In re: Appeal of Times & Seasons, LLC and Benoit*, 2008 VT 7, ¶ 8.

DPS-MK-2 at 25. Mr. Kane further states that "the Project is clearly not designed for compatibility" with its surroundings, and concludes that:

> Overall, we agree with the conclusions within the Landworks Report that the Project will result in an adverse impact to the visual resource. The Project is of a scale and form that is out of character with the existing visual context of the landscape. While the landscape has clear evidence of past resource use, particularly to the west of Lowell Mountain, the development of the prominent ridgeline with 21 large turbines is decidedly unique to what has previously occurred.

Id. at 28. It is therefore clear that the Project would not fit within the character of the area, and would have an adverse effect on aesthetics. Even GMP's expert, Mr. Raphael, concluded that "the noticeable change in the landscape when the Project is viewed from certain vantage points is sufficient to conclude that the Project will result in an adverse impact to aesthetics and scenic beauty of the area." PET-DR-2 at 49. *See Searsburg* Docket No. 5823, Order of 5/16/96 at 27 ("It is very clear that the siting of a large, utility scale, wind generation Project at high elevation on an undeveloped ridgeline of the Green Mountains will have an adverse aesthetic impact on the area").

The Towns would point out, however, that Mr. Raphael made a valiant, albeit wholly misguided, attempt to limit the extent of the adverse impacts, going so far as to suggest that the Project would fit within the "resource character of the landscape," since the location "needs to be where the wind resource is." PET-DR-2 at 49. There is no precedent supporting this claim that a Project may be compatible with the "resource character of the landscape."[47] The character of the

[47] In fact, this argument was explicitly rejected in the *East Haven* case, where the Hearing Officer stated:

> I also conclude that Mr. Owens' proposal is unwise. Under his proposed principles, a wind generation Project that is starkly out of context with the surrounding landscape could nonetheless be found to "fit" because of the wind resource that is present. Such an approach would wrongly change the analysis from one of aesthetics to one of resource economics. It is the former, not the latter, that the Board must evaluate under Section 248(b)(5).

area is defined by the built and natural environment that currently exists, and the *Quechee* analysis calls for a comparison between the existing conditions and surroundings with that of the proposed Project. This is a rural setting, with forest and agriculture, and there are no similar industrial developments. There is no support whatsoever for Mr. Raphael's position in Board precedent (or Vermont Environmental Board or Environmental Court precedent for that matter), and it is a completely inappropriate attempt to limit the aesthetic impacts of the Project, and is one of many examples of Mr. Raphael's misleading and imprudent manipulations in his analysis.

Mr. Raphael further argued that "the national and local landscape has begun to evolve to the point where these facilities are becoming commonplace, and a commonly accepted development pattern in our landscape." PET-DR-2 at 18. This is similarly misleading and inapposite. The *Quechee* test is concerned with the "fit" of a Project within its surroundings, which is a local concern, as evidenced by the 10-mile study area for the aesthetics analysis.[48] There are no other such Projects in the vicinity of the proposed Project site, and therefore industrial wind facilities are absolutely not commonplace or an accepted development in the landscape.

Furthermore, the fact that turbines may be considered commonplace or accepted somewhere else does not mean that they must be considered acceptable in VT, or, more importantly, in this specific location. Vermont in fact has treated aesthetics very differently than other states, such as through Act 250 and the Billboard law, and by Mr. Raphael's twisted

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In Re: Petition of EMDC, LLC, d/b/a East Haven Windfarm ("East Haven"), Docket 6911, Order of 7/17/2006 at 50.

[48] The aesthetics inquiry focuses on whether the Project will "be in harmony with its surroundings," *In re Quechee Lakes Corp.*, Permit Nos. 3W0411-EB & 3W0439-EB, Findings of Fact, Concl. of Law, & Order, at 18 (Vt. Envtl. Bd. Nov. 4, 1985); that is, "whether it will 'fit' the context of the area where it will be located." *Re: Susan Dollenmaier and Martha Dollenmaier Spoor*, Permit #3W0125-5-EB, Findings of Fact, Concl. of Law, & Order, at 11 (Vt. Envtl. Bd. Feb. 7, 2005).

arguments there should be no reason to keep billboards or other eyesores out of Vermont, since they are commonplace and accepted elsewhere. This is a slippery slope that could erode the protections we have placed on the aesthetic resources of Vermont, and this Board must understand that simply because a certain type of development is commonplace and accepted in other places does not provide a valid basis for it being accepted here and each site must be judged on its own merit.

In fact, when DPS witness Mr. Kane undertook this site-specific analysis, he concluded that the Project would be shocking and offensive to the average person due to its effects on the Bayley Hazen road and surrounding area, and therefore the adverse impacts of this Project would be considered undue pursuant to the *Quechee* analysis. Kane, Oct. 22 pf. at 10-11; DPS-MK-2 at 26-31. He further found that GMP has "not adequately addressed impacts to nearby residential and recreational areas." *Id*. Whereas the Department of Public Service's own expert has concluded that the Project would have an undue adverse impact on the aesthetics of the area, a permit may not be issued pursuant to 30 V.S.A. § 248(b)(5).[49]

Albany agrees with Mr. Kane's assessment, and has provided a letter, attached hereto, confirming that the Selectboard, as the representative of the Town of Albany, after hearing all the evidence in this matter, is not in favor of the Project and believes that it would be shocking and offensive, and therefore would have an undue adverse impact on the aesthetics of Albany.

Craftsbury further argues that GMP has failed to adequately address the impacts to the nearby residential and recreational areas within Craftsbury, and that GMP's analysis is incomplete, and as is discussed further below, the Board should find that the Project would be

[49] While Mr. Lamont has provided the Department's opinion that on balance these impacts do not warrant denial of a CPG, Albany disagrees with this analysis, as is discussed further *infra*, and submits that such a balance is not provided for in Section 248, nor is it applicable to the facts of this Project.

shocking and offensive to the average person as seen from Craftsbury. As is set forth in the attached letter from the Craftsbury Conservation Commission,[50] after hearing all of the evidence in this Docket, the Town cannot support this Project, and as the representative of the town they believe that the purported benefits if the Project do not outweigh the adverse impacts, including degradation of the iconic ridgeline of the Lowell Mountains, which is at the core of Craftsbury's sense of place and community identity.

Craftsbury takes issue with GMP's aesthetics analysis regarding views from Craftsbury, and their complete failure to provide even one simulation of the Project as seen from Craftsbury, which even Mr. Kane noted was an oversight.[51] The Craftsbury Town Plan, excerpts of which were provided by Mr. Raphael in Appendix 11 to PET-DR-2, specifically states that the Town's "visual beauty resides in its landscape," and that "Craftsbury is strongly defined by the north-south chain of the Lowell Mountain range to the west." Mr. Raphael, however, makes no mention of this language in his analysis, and fails to even consider why Craftsbury defines itself by the views of the Lowell Mountains, and how the Project would impact that sense of place.[52]

Moreover, Mr. Raphael's analysis was predicated on several opinions regarding the *Quechee* analysis that are simply untenable. Regarding Little Hosmer Pond in Craftsbury, Mr. Raphael concludes that the Project would have an adverse impact on aesthetics; however he finds that the impacts would not be unduly adverse because people could avoid the view by using

[50] The Craftsbury Selectboard has indicated their total agreement with the statements made in the letter provided by the Conservation Commission. *See* attached letters.
[51] Mr. Kane agreed that GMP's failure to include a simulation from Craftsbury was an error/omission. Kane, Feb. 9 at 53.
[52] Aesthetics has been defined as involving "all the senses, including sound, smell, and overall perception. Aesthetics involves the sense of place and the quality of life that a place affords. The Aesthetics of a Vermont village environment include all of the qualities that make it attractive and desirable to live in and visit. *In re Rinkers, Inc*., Decision and Order on Motion for Partial Summary Judgment at 8 (Vt. Envtl. Ct. Aug. 19, 2009) (citation omitted).

those portions of the pond where the Project would not be visible, or could choose to use other ponds in the area. PET-DR-2 at 41. This argument is ridiculous. Under this theory, any impact could be said to be avoidable, since people could simply choose to move away, close their eyes or avoid looking out their windows. Even Mr. Kane agreed that this is clearly not how the *Quechee* analysis is applied, and in his years of providing aesthetics analysis in Vermont he has never seen this supposition used. Kane, Feb. 9 at 49-52.[53]

Indeed, the very fact that Mr. Raphael felt the need to suggest that people could avoid the views or use other ponds as a means of rendering the adverse impacts from Little Hosmer not undue suggests that the views would indeed be shocking and offensive; otherwise there would be no need to avoid them. People use Little Hosmer for quiet recreation, including boating and fishing, in a natural setting that exemplifies the outdoor aesthetic of the Northeast Kingdom. The turbines would be visible from a majority of the pond, and would severely alter the aesthetics and experience for those using this pond. The impacts to Little Hosmer would be shocking and offensive, and have an unduly adverse impact on that public recreational resource. Mr. Raphael's arguments are without merit, and are indicative of the unsupported and misleading testimony he provided in this matter.

Perhaps even more alarming is Mr. Raphael's belief that roads are not considered significant public vantage points unless they are formally designated as Scenic Roads. Henderson-King, Jan. 10 pf. at 1-2. Once again, this is simply not a valid position, and there is no basis for this opinion anywhere in Vermont law or Board precedent. Mr. Kane agreed that

[53] Regarding Mr. Raphael's point regarding the fact you can "find areas, move away, and not have the visual impact," Mr. Kane was asked by Board member Burke "Do you believe it's what an average person should have to do?" and Mr. Kane responded "No. I do not." Feb. 9 at 50-51.

this is not a defensible position, and not how the *Quechee* test is applied. Feb. 9 at 47-49.[54] Mrs. Henderson-King made it clear that not only does the Vermont Byways Program website state that "The best way to 'meet' Vermont is to get off its Interstate Highways and onto our secondary roads," but that public permitting, including Act 250, is concerned about views of proposed developments from public roads. Henderson-King, Jan. 10 pf. at 2. Mr. Raphael's claim is nothing short of a total fabrication.

It remains unclear exactly how this unsupported opinion colored Mr. Raphael's analysis. There are no designated Scenic Roads in the vicinity of the Project (and few anywhere in Vermont), yet the Project will be seen from a majority of roadways in Albany and Craftsbury travelled by the public on a daily basis. It must also be noted that Mr. Raphael did not include formally designated scenic roads on his map found at Appendix 4: Cultural Resources, nor did he include it on the map found at Appendix 7: View from the Road. Since no formally designated Scenic Roads appear to exist in the study area, then it appears Mr. Raphael, based on his erroneous understanding of the role that roads play in the *Quechee* analysis, may have discounted the impacts the views from the road have on the character of the area, and may not have considered these views in his analysis of whether the Project may be shocking and offensive. If Mr. Raphael truly believes that the views from roads – which are certainly public vantage points from which the public experiences the landscape – are not factored in to a *Quechee* analysis unless they are formally designated as Scenic Roads, then it would appear that he has failed to take into account the full impacts of the Project, and his analysis is unsound.

[54] Mr. Kane noted that: "I presume in doing his testimony he considered the roadways as part of his observation of the landscape. So then to hear yesterday that they aren't part of the analysis, I was kind of surprised by it." Kane, Feb. 9 at 49. Mr. Kane further stated that "public roads are considered important public vantage points." *Id*. at 48

Mr. Raphael, perhaps in an attempt to cover his preposterous claims regarding roads as significant public vantage points, states that most of the major roads in the area have limited if any views of the turbine sites. This, however, is belied by the testimony of Mr. Pion, a selectmen from Lowell, who testified that the Project would be visible from many of the roads in the area, and that many roads have prominent views and many people would see the Project from the roads in the area. Feb. 4 at 58-59.[55]

In fact, the basis for Mr. Raphael's opinion regarding the "limited" views of the Project from roads in the area is completely specious. It is based on his employees conducting a field verification, wherein they drove around the study area to confirm where the Project could be seen from. This analysis was provided in Appendix 7 to his report: View from the Road. This map, however, specifically states that "visibility is to the top of the ridge, and does not necessarily account for portions of the turbines that may be visible above ridgeline." It is therefore readily apparent that the map underestimates the visibility of the Project by ignoring the 400+ foot towers that would be placed on the ridge, which would certainly increase the visibility of the Project.

Furthermore, it appears from Appendix 7 that the only roads included in the analysis were major roads in the area, with few secondary roads visited. This ignores several roads that many residents and visitors use on a daily basis, and which may have prominent and uninterrupted views of the Project. It must be noted that, as discussed above, the Craftsbury Town Plan specifically states that "Craftsbury is strongly defined by the north-south chain of the Lowell Mountain range to the west." While this may not qualify as a clearly written community

[55] Mr. Raphael agreed that Mr. Pion, as a Selectman and resident of the area, is more familiar with roads and visibility of the Project site. Feb. 8 at 132-3.

standard, it suggests that altering the views from Craftsbury could be considered shocking and offensive to the average person, since the town defines itself by these views. Craftsbury submits that it is in large part the view of the Lowell Mountains from many of the roads in Craftsbury that are the basis of this statement in the Town Plan, and it appears that Mr. Raphael has discounted or ignored these impacts.

Mr. Raphael has even denied that the Project would be visible from roads within Craftsbury that would in fact have visibility of the Project. As Mrs. Henderson-King explained in her surrebuttal testimony, Mr. Raphael has argued that there are no views of the Project area along Route 14, and very limited views from North Craftsbury road; however this is incorrect and belied by the photo simulation Mrs. Henderson-King provided, showing wide open views of the Lowell Mountains from the Route 14 / Cemetery Road intersection. Henderson-King, Jan. 10 pf. at 1; CFT-GHK-2/3. Furthermore, Mr. Raphael provided photos in discovery proving that there are open views of the Lowell Mountains and the Project area from North Craftsbury Road, and these photos (CFT-GHK-4) show unencumbered views of the Project area from North Craftsbury Road and intersecting Strong Road. Mr. Kane confirmed that his "analysis also suggests that areas of high visibility are highly correlated to large stretches of major roadways (Route 100 and 14)." Oct. 22 pf. at 8.

Once again, Mr. Raphael has miscalculated and underrated the visibility of the Project from important areas, and has failed to include the full extent of the aesthetic impacts in his analysis. Mrs. Henderson-King summed it up perfectly: "Both residents and visitors travel on North Craftsbury Road to access Route 14 and other local roads and the views of the Lowell Mountains from here are impressive enough that people will often stop and take pictures. Mr.

Raphael erroneously downplays the visibility of the Lowell Mountains from this area when he states they are only visible for a short stretch." Henderson-King, Jan. 10 pf. at 1.

It should also be noted that Mr. Raphael appears only to have considered the extent of visibility from roads when viewed from cars, thereby claiming that certain views would only be of short duration (such as "a few seconds" on North Craftsbury where, according to his erroneous analysis based on view of the ridgeline and not the turbines, the Project area would be visible for 0.6 miles). This ignores the fact that people often walk and bike along roads, and visibility would be for much greater lengths of time during these activities. For people walking and biking along these roads, where they currently enjoy an open natural view of the Lowell Mountains, the Project could be shocking and offensive.

Mr. Raphael was further unable to discuss whether he had analyzed the views from several roads in Craftsbury that the Town believes to be significant vantage points for residents to experience the views of the Lowell Mountains, and failed entirely to provide a simulation or even to discuss these views in his analysis. Feb. 8 at 111. Moreover, Mr. Raphael has mistakenly claimed that the Project would not be visible from the Craftsbury Common, and has therefore failed to address the impacts of visibility from this public area.[56] Mr. Raphael's claim of limited visibility was refuted both by the testimony of Mr. Henderson-King, as well as the viewshed maps provided by Mr. Kane, which indicate visibility from the Craftsbury Common. DPS-MK-2 figure 6. Mrs. Henderson-King noted that she visited the site in leaf-off conditions, and the Project would certainly be visible from the Craftsbury Common. Feb. 8 at 8-10. GMP's

[56] The Craftsbury Common is an actively used public space, including a farmer's market that attracts local residents and a large antiques annual event with over 100 vendors that draws a very large crowd. Mrs. Henderson-King Oct. 22 Pf. at 4.

expert on the impacts to historic sites further confirmed that the Craftsbury Village Historic District would have potential views of the Project. PET-LP-1 at 7.

As noted above, Craftsbury defines its character by the views of the Lowell Mountains, and since the Lowell Mountains, and therefore the Project site, are visible from the central public area in Craftsbury, the views of the Project may be considered shocking and offensive to the average person, and Mr. Raphael's total failure to address these matters renders his analysis incomplete. Craftsbury submits that as far as the Town is concerned, such changes to the viewscape would be shocking and offensive and therefore would have an undue adverse impact on aesthetics pursuant to the *Quechee* analysis.

Mr. Raphael has also completely underestimated, and apparently ignored, the tourism in and around the Project, and the potential impacts the Project may have on tourism by changing the character of the area. Mr. Raphael stated in his report that "the immediate area around the Lowell Mountains is not a destination area for tourism." PET-DR-2 at 9. This is entirely false and incredibly misleading. As Mrs. Henderson-King noted in her testimony, "Craftsbury is known as a destination community attracting visitors in all seasons…. The stunning fall foliage juxtaposed against rolling fields and meadows with mountains to the west and east is sought after by visitors from near and far," and further added that "water related activities, such as boating, canoeing and fishing, as well as bike tours also draw people to Craftsbury in the summer and fall." Henderson-King, Oct. 22 pf. at 4. These statements were uncontroverted by GMP.

In fact, on Page 10 of his own report Mr. Raphael acknowledges that "this area of the Green Mountains is most distinguished for outdoor activities like snowmobiling, hunting, bicycling and hiking," and the report also mentions cross-country skiing and "the region's deep lakes and rivers are also <u>famous</u> for the excellent and diverse fishing opportunities they offer as

well as boating activities." What's more, on page 11 of his report (PET-DR-2) he states that "the geographic nature of the area displays some other unique features that attract visitors near and far."

So visitors are attracted from near and far, and the area has famous lakes and rivers, and several activities associated with tourism, but somehow it is Mr. Raphael's belief that this is not a destination for tourists. Mr. Raphael's analysis used this mistaken and baseless characterization to show why the effects of the Project are limited, stating that the "lack of popular destinations and tourism attractions limit the number of viewers as well." PET-DR-2 at 25. This, however, is clearly erroneous, and is indicative of the biased and unfounded testimony that Mr. Raphael provided on behalf of GMP. Mr. Raphael has underrepresented the role that tourism plays, and was unable to provide any information on the number of campgrounds, camps, lodges or vacation homes in the area, or the actual number of tourists or value of the tourism sector. In reality, the area does have robust tourism – especially in and around Craftsbury – and the number of visitors is not as limited as Mr. Raphael would have the Board believe. His analysis is groundless, and his conclusions are tenuous at best.

Craftsbury submits that the Project will indeed be shocking and offensive, due to the impacts on the public areas, including roads, and the tourism and beauty that define Craftsbury. The former Environmental Board has ruled that a Project is shocking and offensive if it is so out of character with its surroundings that it significantly diminishes the aesthetic qualities of the area. *Re: Times and Seasons, LLC and Hubert K. Benoit,* Docket No. 3W0839 -2-EB (Altered), Findings of Fact, Conclusions of Law, and Order at 49 (Vt. Envtl. Bd., Nov. 4, 2005); *Re: Hannaford Brothers*, Docket No. 4C0238-5-EB, Findings of Fact, Conclusions of Law, and Order at 20 (Vt. Envtl. Brd., Apr. 9, 2002). There is no question that the proposed Project is

completely out of character with its surroundings, and would so significantly diminish the aesthetic qualities of the area that it would be shocking and offensive to the average person.

In *J. Philip Gerbode*, Docket No. 6F0396R-EB-1, Findings of Fact, Conclusions of Law, and Order (Vt. Envtl. Bd., Jan. 29, 1992), the former Environmental Board provided some insight into how to analyze whether a Project is so out of character with its surroundings that it rises to the level of shocking and offensive. In that case, the Board found that the adverse effects of an industrial Project located in open fields would not be shocking or significantly diminish the area's aesthetic qualities since similar development already existed in the area, and because the site was located at an Interstate exit, where such development would be expected. *Id*.

This case presents the complete opposite scenario. No such similar development exists anywhere within the vicinity of the proposed Project (especially the eastern side of the Lowell Mountains), and the ridgeline of the Lowell Mountains is certainly not the type of area in which one would expect to see industrial development. Rather, the area to the east of the Project is a rural-agricultural area, with gorgeous sweeping views of the Lowell Mountains, unmarred by any industrial elements, which is why Craftsbury specifically defines its aesthetic beauty by the views of the Lowell Mountains. Craftsbury does indeed have tourism and recreational assets, which are important to residents and tourists alike. The area is not the type of setting where one expects to see this type of industrial development, and the proposed Project would unquestionably diminish the aesthetic qualities of this area by introducing an industrial structure that would alter the natural aesthetic that the town currently enjoys.

Furthermore, while Mr. Raphael included in his report that the Board's assessment of "whether a particular Project will have an 'undue' adverse effect on aesthetics and scenic or natural beauty is significantly informed by the overall societal benefits of the Project," he failed

to include any assessment of how the societal benefits should be balanced against the aesthetic impacts in this matter, providing only ambiguous comments such as "if we are to take responsibility for producing our own power, the impacts associated with that power source will, of necessity be local, rather than elsewhere." PET-DR-2 at 48. It must be noted that Mr. Raphael in fact stated his belief that social benefits should not be weighed against the aesthetic impacts, and only included that statement because the Board has previously declared it to be part of their analysis (Feb. 8 at 194); however the Towns submit that there appears to be no basis in Section 248 for the weighing of societal benefits in the aesthetics analysis. Mr. Raphael is correct that this is unwarranted, and the Board must reconsider how they approach their analysis of aesthetic impacts, given that 30 V.S.A. §248(b)(5) specifically states that "before the public service board issues a certificate of public good… it shall find that the purchase, investment or construction… will not have an undue adverse effect on aesthetics. (emphasis added).

Regardless, Mr. Raphael agreed that we can reduce the impacts, and the impacts may be too high at some locations to warrant constructing such a Project. Feb. 8 at 149, 218. He further agreed that the Board needs to have a full and complete understanding of the potential impacts of the Project in order to make that determination, and Craftsbury submits that, as discussed herein, GMP and Mr. Raphael have clearly not provided sufficient information, but rather have made every attempt to limit the scope of impacts, and to provide a deceptive and unreliable analysis that ignores very important concerns.

For example, Mr. Raphael would have this Board believe that 450-foot metal towers on a prominent ridgeline would only be visible from 5% of the 10-mile radius study area for this Project. This is not only unreasonable, it is disputed by several other aesthetics experts, including not only Mrs. Gail Henderson-King, but Mr. Kane testifying on behalf of DPS. Many

of Mr. Raphael's responses during cross examination and the findings set forth in his report were simply not credible, and the Board should carefully consider the incredibly biased and misleading picture he has painted regarding the aesthetic impacts of this Project.

Mr. Raphael has in fact taken great pains to limit, as much as possible, the aesthetic impacts of the Project shown by his analysis. First of all, he calculated visibility based on hub height, rather than tip of blade – a difference of 25-30 meters. This is inexplicable, since the turbine blade is not only visible,[57] it is moving, which may draw the eye to it. Mr. Raphael provides no valid basis for measuring only to hub height, and it is clear that this approach has resulted in a very limited measure of the scope of visibility of this Project.

Second, Mr. Raphael modified the underlying bare earth terrain within areas of existing forest cover by adding an arbitrary height (40 feet) to simulate the presence of forest cover on adjacent open lands. This has the result of rendering these forested areas as fully obstructed from a viewer on ground level. When this assumption is incorporated into a viewshed analysis it decreases the potential visibility both inside and outside areas of forest cover to simulate screening. Mr. Kane testified that this underrepresented the visibility of the Project, and does not provide a worst-case scenario.[58] In fact, Mr. Kane believes that as much as 25% of the study

[57] On page 18 of Mr. Raphael's report (PET-DR-2) he stated, in describing the turbine blades, that "The rotor blades also taper and have a very thin cross section, which reduces their profile and distinct visibility beyond 6 miles." Therefore we can assume that within 6 miles, the rotor blades will be distinctly visible.
[58] Mr. Kane testified that Mr. Raphael's analysis indicates that there will be screening in many areas where there may not actually be screening, and that Mr. Raphael chose to use a method that would minimize the visibility of the Project rather than depict a worst case scenario. In other words he didn't err on the side of caution. Kane, Feb. 9 at 45-46.

area would have visibility of the Project, which puts into perspective just how biased and misleading Mr. Raphael's analysis was. Kane, Oct. 22 pf. at 6.[59]

Mr. Raphael's Aesthetic Assessment is simply incomplete and GMP has not met its burden to fully address the aesthetic impacts of the Project. The Board should be wary of the incomplete analysis provided by the Applicant, and should find that GMP has not adequately defined the scope and impact of the Project on the aesthetics of the surrounding area, including from Craftsbury. The Board should also find that the Project would be shocking and offensive to those in Albany and Craftsbury, and therefore the application must be denied pursuant to 30 V.S.A. § 248(b)(5).

B. The petitioner has failed to adequately address the impacts of the Project on tourism and property values, and their economic impact analysis is flawed.

Findings:

113. The REDYN model used by GMP only used input data provided by GMP, and the information and results were not independently verified. Kavet Feb. 4 at 102.

114. We will not know the actual effects on property values until the Project is built. Kavet, Feb. 4 at 108.

115. Mr. Kavet is not a real estate appraiser and did not have a real estate appraiser review his analysis of the potential impacts the Project might have on property values. Kavet, Feb. 4 at 120.

116. "Craftsbury is known as a destination community attracting visitors in all seasons…. The stunning fall foliage juxtaposed against rolling fields and meadows with mountains to the west and east is sought after by visitors from near and far," and further added that "water related activities, such as boating, canoeing and fishing, as well as bike tours also draw people to Craftsbury in the summer and fall." Henderson-King, Oct. 22 pf. at 4.

[59] And even this does not adequately reflect the impacts because people do not live evenly distributed over the land, but rather residential areas are concentrated along the roads and in the places that will have the most visibility of the Project site.

117. There is a "substantial tourism industry in Vermont and Orleans County," and "this is a topic of heightened local importance." PET-TEK-2 at 8.

118. Fewer homes, especially vacation homes, may be built after the wind Project is developed due to its aesthetic impacts, which would be an economic loss to the area.

119. Mr. Kavet performed no analysis of the potential impacts on the actual towns in the vicinity, and did not incorporate any site-specific information about why people have chosen to live in the area into his conclusions regarding property value impacts. He only provided a literature review. Feb. 4 at 103.

120. The article relied on by Mr. Kavet, entitled *"The Impact of Wind Power Projects on Residential Property Values in the United States; A Multi-Site Hedonic Analysis*," has been highly criticized and does not provide an accurate or reliable analysis, since the authors have not verified the factual accuracy of the data upon which their conclusions are based. The article should not be "misunderstood as an entirely academic work product. It is in fact funded by a proponent of the wind energy industry." DPS-JB-6 at 2-3. Further, the study was dominated by transactions where no influence is reasonably likely, significantly skewing the results to show no impact on property values over all. ALB-JB-5 at 3.

121. Even Mr. Kavet agreed that some individual homes in the vicinity of the Project could be negatively affected. PET-TEK-2 at 6. Mr. Kavet failed to assess how many actual homes in the vicinity of the Project may be negatively affected, and by how much, nor did he take into account the associated impacts on property taxes. Mr. Kane testified that as many as 120 homes are within the area he believes will suffer undue adverse aesthetic impacts from the Project. Kane, Feb. 9 at 40, 76.

122. For the property owners the impact of a reduction in property value can result in a lower selling price, hence less cash received at the time of sale. Also even if the property isn't sold, the property owner could be affected by a reduction in property value as it may hinder the owner's ability to refinance or obtain a home equity loan based on the new value of the property. If certain properties are devalued as a result of this wind Project and are reassessed by the town's lister for property tax purposes at this lower value, the property owners will be paying a lower amount in property taxes based on their lower assessed value. Becker, Oct. 22 Pf. at 6.

123. "Home ownership is the single largest investment for most Americans throughout their lifetime, and it is deserving of protection under circumstances where legitimate risk from such a profit-driven use exists." DPS-JB-6 at 4.

124. The McCann review states that in their experience, "the sale price per square foot of residential living area was discernibly different for those homes nearest the wind farm,

with an average price about 20% lower than the unit price of the more distant homes." *Id*. at 5.

125. The Board could protect neighboring home owners by requiring a Property Value Guarantee (PVG), which would include a homeowner option to sell their property to the developer at an appraised value that assumes no turbines are present, in the event traditional marketing efforts are unsuccessful; payment for diminution of value in zones nearest the perimeter of any Project; and use of current home prices as comparables, at the time any claim for compensation was made (to eliminate the effect of "normal" fluctuations of the market). *Id.* at 3.

Discussion:

GMP has attempted to downplay the tourism that occurs in the vicinity of this Lowell Mountains, and which may be adversely impacted by the Project. Both Mr. Kavet and Mr. Raphael claimed that there is a relatively small tourism sector in and around Lowell; however Mr. Kavet also stated that there is a "substantial tourism industry in Vermont and Orleans County," and, as discussed above, Mr. Raphael admitted that visitors are attracted to the area from near and far, and the area has famous lakes and rivers, and several activities associated with tourism, such as snowmobiling, cross-country skiing, bicycling and hiking.[60] Furthermore, neither Mr. Kavet nor Mr. Raphael had any idea how many camps, campgrounds, lodges or vacation homes are in the area, nor were they aware of the amount of land available for growth in this sector, or how the Project might limit that growth. Kavet, Feb. 4 at 96.

Mr. Kavet claims that he based his analysis of the potential effects on tourism on the 13 years of experience at the Searsburg facility; however he provides no citation to any actual information from any study (other than the fact that 10% of those visiting the Mt. Snow

[60] Mr. Kane agrees that Craftsbury is a tourist destination. Kane, Feb. 9 at 46.

Haystack Regional Chamber of Commerce ask for information on the turbines),[61] and fails to even provide a summation of the study that he claims to have relied on. PET-TEK-2 at 8. Furthermore, Searsburg is in a very different area, which has already been built up, and Mr. Kavet even agreed that a landowner may be more apt to keep visiting a vacation home they already own after a windfarm is built nearby than maybe to build a new vacation home after a windfarm is put up, and he failed to consider the fact that regardless even of real estate values, fewer homes, especially vacation homes, may be built after the wind Project is developed due to its aesthetic impacts, which would be an economic loss to the area. Feb. 4 at 99-101.

Regarding the potential impact the Project may have on property values, Mr. Kavet admitted that he performed no analysis of the potential impacts on the actual towns in the vicinity, and did not incorporated any site-specific information about why people have chosen to live in the area into his conclusions regarding property value impacts. Feb. 4 at 103, 108. Mr. Kavet provided only a "literature review," which happened to only mention the literature that supports his position, as his conclusions appear to be reliant on one specific study that has been the subject of much controversy and criticism – though of course Mr. Kavet failed to mention this in his report.

Mr. Kavet, who is not a real estate appraiser and did not consult with a real estate appraiser for his analysis, has relied on the findings of the December 2009 report by the Lawrence Berkeley National Laboratory (Berkeley Lab), entitled *"The Impact of Wind Power Projects on Residential Property Values in the United States; A Multi-Site Hedonic Analysis*." This report, which is not published in any journal, provides an incredibly unreliable viewpoint

[61] This says nothing about whether people were offended or not by the Project, as people could have been asking about the Project because they found it out of character with its surroundings and wanted to know what it is doing there. It must also be noted that the Searsburg facility has much smaller turbines than those proposed in this matter, and therefore different aesthetic impacts.

regarding the potential impacts on property values. While Mr. Kavet touts the reputation of the Lawrence Berkeley National Laboratory, the study in question has been highly criticized, which even Mr. Becker mentioned in his testimony. Mr. Becker in fact included as exhibits two articles that discuss the fundamental flaws in the hedonic analysis conducted by the authors of this report.

One critic, McCann Appraisal, LLC, which reviewed the study pro bono and has specialized knowledge of wind farms and property value impacts, specifically states that the study should not be "misunderstood as an entirely academic work product. It is in fact funded by a proponent of the wind energy industry." DPS-JB-6 at 2. McCann discusses the disclaimer provided by the authors of the report, stating that "The Report disclaimer is appropriate as it puts potential users on notice that the authors have not verified the factual accuracy of the data upon which their conclusions are based. This is relevant in the review process, given the likely reliance on the Report by zoning boards and wind industry developers and proponents." *Id*. at 2-3 (emphasis added).

The other critic, a professional appraiser named Albert Wilson, who specifically states that he is providing "no opinion concerning the impact of wind power Projects on residential property values and instead focuses on the underlying methods used in the development of the Report," suggest that the methods used are not suited to isolating the relationship between property values and the proximity of turbines. Since the study used an "average" home, taken from data across nine different markets, it cannot show market specific results. DPS-JB-5 at 1-3.

Furthermore, less than 10% of the sales transactions used in the Report had any view of turbines, and only 2.1% had a view rated greater than minor. Therefore, the study was dominated by transactions where no influence is reasonably likely, significantly skewing the results to show

no impact on property values over all. DPS-JB-5 at 3. The McCann review suggests that this lack of "data in the most proximate locations is evidence, in and of itself, that the wind turbine Projects are thwarting the successful marketing of residential properties in numerous locations. The regression analysis employed in the Report is not capable of discerning this observation, and is not considered to be reliable by McCann for those properties nearest the Project locations." DPS-JB-6 at 4. The McCann review states that in their experience, "the sale price per square foot of residential living area was discernibly different for those homes nearest the wind farm, with an average price about 20% lower than the unit price of the more distant homes." *Id*. at 5.

Additionally, Mr. Wilson explains that the accuracy of the report, measured by R^2, is very low, with the authors reporting an R^2 of 0.78 or lower. This is much lower than the 0.90 R^2 required for estimate to sales price models under the IAAO standards. DPS-JB-5 at 2. The critics of the study further indicate that the authors did not calibrate their model using data sets of real world transactions to ensure the results were reliable and to fine tune the models coefficients. *Id*. at 4-5. Lastly, the authors refused to release the underlying data as part of the peer review process, making it impossible for reviewers to apply an alternate methodology to cross-check the conclusions of the authors. DPS-JB-5 at 4; DPS-JB-6 at 2, 4.

Mr. Kavet further relies on a study called the REPP Report (PET-TEK-2 at 7); however this report has also been highly criticized, with one appraiser stating that "the REPP study suffers from several flaws. It is methodologically unsound and it relies on data that fail to isolate for particular negative impacts from wind turbines." DPS-JB-7. In the opinion of a professional appraiser that provided testimony before the Public Service Commission of Wisconsin (included as an exhibit to Mr. Becker's testimony), "negative impacts from [a wind] Project due to view loss alone, may cause 17-20% land value loss." *Id.* This is consistent with the opinion expressed

by McCann as discussed above, and therefore it appears that we should expect around a 20% reduction in value of homes in the vicinity of the Project.

Regardless of the flaws in the studies relied upon by Mr. Kavet, he did agree that some individual homes in the vicinity of the Project could be negatively affected. Mr. Kavet failed entirely, however, to assess how many actual homes in the vicinity of the Project may be negatively affected, and by how much, nor did he take into account the associated impacts on property taxes. This is no small matter, since Mr. Kane, on behalf of DPS, has testified that up to 120 homes are within the area that he feels would suffer an undue adverse impact from the Project. Kane, Feb. 9 at 40, 76. The failure of the petitioner to assess the impacts of a possible 20% reduction in the value of 120 homes in the vicinity of the Project renders their economic analysis entirely flawed, and they have clearly not met their burden to provide sufficient information to the Board on this matter.

As Mr. Becker explained, he agrees that the properties in the vicinity of the Project may be negatively affected, and

> For the property owners the impact of a reduction in property value can result in a lower selling price, hence less cash received at the time of sale. Also even if the property isn't sold, the property owner could be affected by a reduction in property value as it may hinder the owner's ability to refinance or obtain a home equity loan based on the new value of the property. If certain properties are devalued as a result of this wind Project and are reassessed by the town's lister for property tax purposes at this lower value, the property owners will be paying a lower amount in property taxes based on their lower assessed value.

Becker, Oct. 22 Pf. at 6. This would either shift the tax burden to others, or potentially create shortfalls in the municipal budget. Since there may be over 120 homes that are impacted, this is an important issue for determining whether the Project is in the public good. The Board must consider the impacts to these homeowners, who are members of the public and deserve

protection from having their investment sacrificed. As the McCann letter states, "home ownership is the single largest investment for most Americans throughout their lifetime, and it is deserving of protection under circumstances where legitimate risk from such a profit-driven use exists." DPS-JB-6 at 4.

In fact, the McCann letter provides a resolution to this issue that the Board should take note of, which is to "require a Property Value Guarantee (PVG), as part of the conditioned approval of any large-scale wind energy zoning Project application." *Id.* at 3. A PVG would:

> include homeowner option to sell their property to the developer at an appraised value that assumes no turbines are present, in the event traditional marketing efforts are unsuccessful; payment for diminution of value in zones nearest the perimeter of any Project; and use of current home prices as comparables, at the time any claim for compensation was made (to eliminate the effect of "normal" fluctuations of the market). This type of PVG can be fairly, objectively and successfully implemented by a well run energy company and/or the political jurisdiction of the Project locations. A PVG would alleviate concern over the very issue acknowledged and studied by the authors of the [Lawrence Berkeley] report and observed first hand by McCann.

Id. Albany suggests that this appears to be a fair means of alleviating the potential burden that this Project will place on those living in the vicinity, and whose property and investment should not be sacrificed for what GMP claims to be the greater good. If GMP truly believes that the Project would not cause an adverse impact to property values, then this type of guarantee should not be objectionable. Absent a PVG or some other means of protecting the substantial members of the public whose property values may be negatively impacted, this Project cannot be said to be the in the public good.

The economic assessment performed by Mr. Kavet is clearly inadequate and the Board should give little credence to his conclusions. The REDYN analysis that Mr. Kavet conducted was based entirely on data provided by the petitioner, with no third party oversight from anyone,

including DPS. Kavet, Feb. 4 at 102. As discussed herein, the results of GMP's economics analysis are entirely flawed, and the results of the REDYN modeling suspect, since they failed to take into account appropriate data on tourism and property values.[62] The Board must find that GMP has not met their burden to provide sufficient information, and that the impacts of the Project are more severe than GMP has propounded. Whereas these impacts would affect the public good, the Board cannot issue a CPG based on the inadequate analysis GMP has provided.

C. The Department of Public Service has found that there will be an undue adverse impact on aesthetics, and Mr. Lamont improperly balanced the aesthetic impacts with the benefits of the Project.

Findings:

126. Mr. Lamont initially testified that this Project would not meet the requirements of 30 V.S.A. 248(a)(2), and therefore the Department did not support issuance of a CPG. This was based on Mr. Kane's testimony that the Project would have an undue adverse aesthetic impact. Feb. 24 at 94.

127. Mr. Lamont has changed his testimony, and now asserts that, on balance, the Project would be in the public good. Mr. Lamont relies on a footnote from the Board's decision in Docket 6911 to support this balance. Jan. 10 pf. at 6-7. The balance Mr. Lamont describes is not provided for in 30 V.S.A. § 248.

128. Mr. Lamont did not quantify the costs and benefits of the Project. He changed his testimony based on subjective assessments of costs and benefits, and was unable to provide any real analysis. Feb. 24 at 109, 146. Mr. Lamont in fact specifically stated that "this was a subjective analysis." *Id*.

129. Mr. Kane has not changed his testimony, and continues to assert that the Project would have an undue adverse impact on aesthetics pursuant to the *Quechee* test as incorporated by 30 V.S.A. § 248(b)(5). Pursuant to this criterion, the Board may not issue a permit if they find that there is an undue adverse impact to aesthetics.

[62] Mr. Kavet explained that the property value assessment information is necessary to adjust the REDYN model. Feb. 4 at 103. Further, Mr. Kavet admitted that he based his statements regarding the value of the tourism sector on meals and rooms tax, which provides an incomplete picture of the actual benefits tourism brings to the region. Feb. 4 at 94, 97. If Mr. Kavet is willing to use such limited and deficient information for an issue (tourism) that he himself stated was "a topic of heightened local importance," then the Board should be wary and question exactly what was used in the model for Mr. Kavet's economic analysis. PET-TEK-2 at 8.

130. Mr. Lamont stated that he altered his opinion after Mr. Kane quantified and qualified the undue adverse aesthetic impacts. Mr. Kane had provided the specific area he was concerned with in his initial testimony (on which Mr. Lamont relied for his testimony) and subsequently explained that as many as 120 homes are within the area he deems would be impacted to a shocking and offensive degree by the Project. Feb. 24 at 145-147.

131. These 120 homes may experience negative impacts from the Project, including property devaluation. This is a substantial number of homes, and would therefore have an impact on the public benefits of this Project.

Discussion:

It is well known to this Board that Mr. Lamont, on behalf of the Department, initially testified that the Project would not meet the requirements of 30 V.S.A. 248(a)(2), and subsequently altered his opinion in his surrebuttal testimony. What has not changed is the testimony of Mr. Kane, who found that the Project would be shocking and offensive to as many as 120 homes in the vicinity of the Project, and would have an undue adverse impact pursuant to Criterion 8 of Act 250.

Mr. Lamont had based his initial opinion that the Project would not promote the general good of the State pursuant to 30 V.S.A. 248(a)(2) on the testimony of Mr. Kane. While Mr. Kane has not changed his testimony, Mr. Lamont subsequently found that on balance the Project would promote the general good of the State; however it is clear from his testimony that he did not perform a proper analysis of the costs and benefits of the Project, but rather is offering merely an unsupportable and wholly subjective analysis that has clearly been compromised by political pressure.

Mr. Lamont has based his altered opinion on Board precedent that, when actually reviewed, does not support his conclusions. Mr. Lamont points to the Board's attempt to balance the benefits and costs of the proposed development as set forth in *In Re: Petition of EMDC, LLC,*

d/b/a East Haven Windfarm, Docket 6911, Order of 7/17/2006 at 103, n.125 ("*East Haven*"). Not only is this reliance on a mere footnote unfounded, but his application of the Board's statement is inapposite since the facts of this case, when compared to *East Haven*, do not support his contentions.

In *East Haven*, the Board was faced with a much different situation. The Project was not, according to the Order, visible from any homes in the immediate vicinity,[63] but rather was only visible from portions of the conserved Champion Lands – an area of protected land infrequently visited by outdoor recreationists. In addition, the Order specifically states that the turbines would only have been visible from very limited and remote areas, and then most likely only by those who were travelling by snowmobile, thereby rendering the impacts extremely limited. *East Haven* at 102-3.

This is so far removed from the impacts of the proposed Project as to render Mr. Lamont's analysis unsupportable. Mr. Kane testified that as many as 120 homes are in the area that he believes would suffer shocking and offensive aesthetics impacts. This would very likely reduce the value of the homes in this area, as is discussed further above. No such impacts were present in the *East Haven* case. Unlike the Project at issue in *East Haven*, the proposed Project would be visible from several major roads, village centers and other areas regularly visited and travelled by the public, including within Craftsbury, which as noted above defines its visual beauty by the views of the Lowell Mountains, and relies on the character of the area for its tourism.

[63] Some homes would have had views of the Project, but the Order notes that these were more than 7 miles away, and not considered to have an adverse impact. *East Haven* at 54.

Additionally, Mr. Lamont stated that he changed his opinion after discussing the matter with Mr. Kane, who he claims quantified and qualified the extent of the impacts; however Mr. Kane made it perfectly clear in his initial testimony – upon which Mr. Lamont had relied for his initial opinion that the Project would not promote the general good of the state – the exact area that would suffer undue adverse aesthetic impacts. It remains unclear why Mr. Lamont was perfectly comfortable, based on this information, claiming that the Project would not promote the general good of the state, yet changed his mind when it was explained to him that up to 120 homes would suffer undue adverse aesthetic impacts – which dwarfs the impacts at issue in *East Haven* and cannot be considered "quite small in number," which is how the Board characterized the impacts in *East Haven*. Lamont, Jan. 10 pf. at 6. Remarkably, Mr. Lamont also did not seem aware that Mr. Kane has not in fact changed his testimony, and has continued to state his opinion that the Project would have an undue adverse aesthetic impact.

Furthermore, Mr. Lamont has suggested that while the costs may be greater for this proposed Project than in *East Haven*, the benefits were also greater; however he could not explain how he actually valued these costs and benefits in undertaking his "analysis." He did not put any actual value on the aesthetic impacts; he did not put a value on the loss of the forest cover, and the loss of carbon sequestration; and he could not explain the actual values he used to make his determination. Indeed in the East Haven case, one of the benefits of the Project that was listed in the Board's order was sale of the Project's output to the local electric department at five percent below the market price. There does not appear to be a similar economic benefit to ratepayers in this matter. *East Haven* at 102.

It is clear from his testimony that Mr. Lamont in fact did not conduct any real analysis, but has changed his opinion based on nothing more than political pressure, and has attempted to

cover his obvious and baseless change in position by relying on a statement made by the Board, in a footnote, regarding a balance that does not apply to this matter, and is not provided for anywhere in Section 248.

The Board should see Mr. Lamont's surrebuttal testimony as nothing more than a desperate attempt by the Department to appease the Governor, who has made it quite clear that he has directed his agencies (ANR and DPS) to support this Project. This has had a chilling effect on the ability of these agencies to perform independent analysis based on the facts, rather than political motivations; however, thankfully the Board, as a quasi-judicial authority, is not subject to such political influence, and must base its decision on the statutory criteria in 30 V.S.A. § 248.

Mr. Lamont's testimony provided various actions undertaken by the legislature to promote renewable energy Projects in Vermont; however the Board is well aware that Section 248 has not been amended or changed. It still states that:

> (b) Before the public service board issues a certificate of public good as required under subsection (a) of this section, it shall find that the purchase, investment or construction:
>
> ***
>
> (5) will not have an undue adverse effect on aesthetics, historic sites, air and water purity, the natural environment and the public health and safety, with due consideration having been given to the criteria specified in subsection 1424a(d) and subdivisions 6086(a)(1) through (8) and (9)(K) of Title 10;

The Legislature has not amended Section 248 to make it easier for wind Projects to receive a permit, nor have they limited the aesthetics analysis for these Projects – even though they have the ability to do so. Therefore, while the State may be in favor of renewable energy Projects, this Board still needs to decide whether individual Projects meet the statutory criteria set forth in Section 248. This requires a case by case analysis; however Mr. Lamont appears to

be basing his opinion on general concepts regarding the benefits of renewable resources, while ignoring the actual impacts of this particular Project, which far outweigh the impacts at issue in *East Haven*.

Further, 30 V.S.A. § 248 does not provide for the type of balancing act that Mr. Lamont used to change his opinion, which is why he has relied on a footnote from a case in 2006, rather than the applicable statutory criteria. There is simply no provision that allows the Board to balance the aesthetic impacts against the benefits of the Project.

Even if allowed, such a balance should only be relevant where the impacts to the public are extremely limited, such as was the case in *East Haven* where the Project was not visible from any homes, and therefore the costs associated with the aesthetic impacts were almost non-existent. Where the Project would impact a large number of the public on a daily basis, and reduce the value of up to 120 homes – with the related impacts on the tax base, as well as the potentially devastating affect that would have on homeowners whose homes may be their only investment – the Board, unlike Mr. Lamont, must consider the full extent of the impacts. These homeowners are members of the public, and their investment and quality of life must not be sacrificed just because Mr. Lamont was forced to change his opinions and managed to ferret out a footnote that he could use to justify his position, albeit it without conducting any real analysis.

The fact is that nothing has changed with regards to this Project since Mr. Lamont provided his initial testimony. Mr. Kane, on behalf of the Department has stated that this Project will have an undue adverse impact on aesthetics, and therefore 30 V.S.A. § 248(b)(5) is not met, and this has not changed. The impacts remain the same, as do the benefits. Albany and Craftsbury submit that the initial testimony of Mr. Lamont provided his true, unbiased opinions

regarding this Project. The Project was not in the general good of the state then, and it remains so today.

IV. THE PROJECT WILL HAVE UNDUE ADVERSE IMPACTS ON NATURAL COMMUNITIES.

Findings:

132. The Project would cause fragmentation of the habitat of the Lowell Mountains Block. The "primary concern is the KCW Project's fragmentation of the state-significant natural communities and the large, contiguous habitat block associated with Lowell Mountain, and the effect of this fragmentation on natural communities, ecological processes, and interior forest habitat." Sorenson, Oct. 22 pf. at 4.

133. The Project area contains natural communities that are of state significance, including Montane Spruce-Fir Forest and Montane Yellow Birch-Red Spruce Forest. Based on the sizes of the natural communities, the current condition of the natural communities, the large, relatively unfragmented landscape in which they occur, both are considered state-significant natural communities by VFWD using the Department's standard natural community ranking procedures. *Id*. at 7-10.

134. "The proposed construction and clearing for the KCW Project will degrade the Montane Spruce-Fir Forest to the degree that it will no longer be considered state-significant, using the same VFWD ranking specifications." *Id.* at 14.

135. Absent sufficient mitigation, the Project would have an undue adverse impact on the natural communities, and the Board may not issue a CPG pursuant to 30 V.S.A. § 248 (b)(5).

136. The Project would have an undue adverse effect as a "result of substantial and permanent habitat fragmentation associated with construction of access roads, ridgeline crane roads, turbine pads, construction staging areas, stormwater management structures, collector lines, and the associated forest clearing." Sorenson, Oct. 22 pf. at 19-20.

137. GMP and ANR entered into an MOU regarding the habitat fragmentation caused by the Project.

138. The MOU does not cover the degradation of the Montane Spruce-Fir Forest to the degree that it will no longer be considered state-significant. ANR-GMP-1.

139. The MOU provides for mitigation for the habitat fragmentation caused by this Project through GMP acquiring fragmentation-connectivity easements. These easements are not identified by the MOU, and have not been acquired by GMP at this time.

140. The MOU does not cover all of the concerns raised by Mr. Sorenson in his testimony: Not all of the easements are permanent, and the entire ridgeline is not protected from future development.

141. The MOU is, in large part, an agreement to work on several plans that are essential for mitigating the impacts to the natural environment; a site restoration plan, a non-native species plan and a monitoring plan. None of these plans have been completed at this time.

Discussion:

There is no doubt that this Project will have an adverse impact on the natural communities in the Lowell Mountains, and will cause fragmentation of the landscape. As Mr. Sorenson from ANR explained, the "primary concern is the KCW Project's fragmentation of the state-significant natural communities and the large, contiguous habitat block associated with Lowell Mountain, and the effect of this fragmentation on natural communities, ecological processes, and interior forest habitat." Oct. 22 pf. at 4.

While ANR has entered into an MOU with GMP regarding several of the issues that ANR has raised regarding the undue adverse impacts of the Project to bear scarred beech and habitat fragmentation, the MOU does not cover all of these concerns, nor does it fully remediate all of the ecological impacts of the Project. For example, Mr. Sorenson testified that there are natural communities that are of state significance on the Project site, including Montane Spruce-Fir Forest and Montane Yellow Birch-Red Spruce Forest. "Based on the sizes of the natural communities, the current condition of the natural communities, the large, relatively unfragmented landscape in which they occur, both are considered state-significant natural

communities by VFWD using the Department's standard natural community ranking procedures." Sorrenson, Oct. 22 pf. at 10.

He further testified that these state significant areas will be degraded by the Project, and that "the proposed construction and clearing for the KCW Project will degrade the Montane Spruce-Fir Forest to the degree that it will no longer be considered state-significant, using the same VFWD ranking specifications. This is a clear and objective method for assessing changes to natural communities." *Id*. at 14. It is Mr. Sorenson's opinion that this is an undue adverse impact on the environment, and he agreed that preserving more land in the area through the MOU does not at all change this impact. Feb. 24 at 122, 194, 200, 207, 219. Whereas regardless of the MOU the Project would still have an undue adverse impact on the natural communities, the Board may not issue a CPG pursuant to 30 V.S.A. § 248 (b)(5).

Furthermore, the MOU itself does not address all of Mr. Sorenson's concerns regarding habitat and fragmentation impacts. Mr. Sorenson explained that he would like to have seen permanent easements, since the impacts will be permanent; however the MOU calls for some temporary easements instead. Oct. 22 pf. at 28; ANR-GMP-1. He also testified that he would like to have the petitioner establish a "permanent conservation easement or land acquisition to conserve the high elevation forests in the Project area, guaranteeing that there will be no future development other than the current wind energy Project along this sensitive ridgeline." Oct. 22 pf. at 28. The MOU does protect the ridgeline area just around the turbines from future residential development; however the protected area does not cover the entire ridgeline, and therefore does not provide the level of protection Mr. Sorenson called for to fully offset the otherwise undue adverse impacts. *See* ANR-GMP-1 and attached map; Feb. 24 at 209.

Moreover, several major concerns that Mr. Sorenson raised in his testimony and which are addressed in the MOU are not adequately resolved by the MOU, but rather suggest that ANR and GMP will continue to work on these matters; however that is not enough for this Board to find that the concerns raised by ANR will actually be resolved by the MOU. For example, Mr. Sorenson testified that in order to remediate the fragmentation of the landscape, GMP must establish conservation easements to secure the connectivity of the large, relatively unfragmented Lowell Mountain Block with large habitat blocks to the south. Oct. 22 pf. at 29. The MOU covers this in section 3.2 – Fragmentation-Connectivity Easements.

The MOU, however, does not state that such easements have been granted to GMP, nor does it specify exactly where or how large the easements must be to provide the type of remediation that would actually offset the issues raised by Mr. Sorenson with regard to habitat fragmentation. All it states is that they must be "prudent" and of "adequate size," and must be approved by ANR;[64] however it is not up to ANR to decide whether the Project will have an undue adverse impact on the natural environment – that is for the Board to decide, and given the very strong testimony of Mr. Sorenson indicating that this Project would certainly have an undue adverse impact on the natural environment absent adequate mitigation, the Board must not simply rely on ANR approving, at some future time, easements that have yet to be identified. If the Board is to accept this MOU, there must be an opportunity to review the actual easements, if they are ever obtained, and there must be an opportunity for the parties that have intervened on this matter to question Mr. Sorenson to determine whether his concerns are actually being addressed.

[64] ANR-GMP-1 at 9.

In addition, section 3.2 of the MOU states that "if GMP cannot procure such conservation easements… consistent with discussions with ANR and the testimony of Eric Sorenson… GMP and ANR will work in good faith to enable GMP to acquire connectivity easements of comparable scale and ecological value to address connectivity in the Lowell Mountain Habitat block." ANR-GMP-1 at 9. This is not only incredibly vague, but it completely fails to provide adequate assurances that the concerns raised by Mr. Sorenson would actually be addressed.

Mr. Sorenson was very clear in his testimony that the Project would have an undue adverse effect as a "result of substantial and permanent habitat fragmentation associated with construction of access roads, ridgeline crane roads, turbine pads, construction staging areas, stormwater management structures, collector lines, and the associated forest clearing." Oct. 22 pf. at 19-20. He further testified that in order to address this, GMP would need to "establish conservation easements to secure the connectivity of the large, relatively unfragmented Lowell Mountain Block with large habitat blocks to the south. The most effective location for conserving this habitat connectivity may be along Boomhour Branch in the vicinity of East Hill Road." *Id*. at 29.

The MOU also states that these easements must be obtained "prior to commercial operation" of the Project. ANR-GMP-1 at 9. This indicates that the Project could be constructed prior to these easements being established, but that it would not be able to operate if it turns out the easements are not available. This is untenable, and must be rejected by the Board. Pursuant to this, all of the fragmentation that is the focus of the MOU's mitigation efforts could already have occurred prior to the easements necessary to mitigate those impacts being in place. If it turns out the easements are unavailable, all of the harm Mr. Sorenson discussed will take place, without any of the mitigation occurring, and without any of the purported environmental benefits

of the Project ever accruing. The Board must not allow the clearing and road building that will fragment the landscape to take place prior to ensuring that all of the mitigation efforts are firmly in place, otherwise the risk of the impacts occurring without any mitigation is very possible, which certainly would not be in the public good, or provide adequate assurances that the Project will not result in an undue adverse impact to the natural resources in the area. In order to ensure that the Project will not have an undue adverse impact on habitat fragmentation, the Board must require that these easements be in place prior to construction, and make certain that adequate mitigation is in place before the harm occurs.

The MOU further provides an option for alternate easements of "comparable size and ecological value" should the actual lands that Mr. Sorenson believes are necessary to offset the fragmentation impacts of the Project not be available. *Id*. This option allows for indirect mitigation that would potentially not resolve the actual impacts that this Project will have on forest fragmentation. This provision, absent further information regarding how these alternate easements would actually address the fragmentation caused by this Project, should not be accepted by the Board. If this provision is utilized, Albany and Craftsbury would ask for the opportunity to recall Mr. Sorenson to cross examine him as to how these alternate easements actually address the fragmentation caused by this Project, and how they will mitigate what otherwise Mr. Sorenson testified would be an undue adverse impact.

Once again, it is not up to ANR to decide whether the Project meets the statutory criteria - that is for the Board to decide, and the testimony provided by ANR suggests that this issue, if not adequately addressed, would require denial of a CPG. The MOU is too vague to provide the Board with any assurances that these important concerns will actually be met, and therefore if the MOU is to be accepted by the Board, it must be conditioned not only on all of the components

being fulfilled, but the Board must provide an opportunity for the parties to review the undefined easements and provide testimony to the Board regarding the adequacy of the remediation efforts.

Similarly, the MOU appears, in large part, to be an agreement to work on several plans that are essential for mitigating the impacts to the natural environment; however without actually seeing these plans the parties are unable to comment on their efficacy, nor can the Board see what is actually being proposed to ensure that the concerns raised by ANR will actually be mitigated. For example, sections 4.4-4.6 of the MOU state that ANR and GMP will work on creating a site restoration plan, a non-native species plan and a monitoring plan, and section 4.7 states that these will be submitted to ANR for review and approval before submitting them to the Board. ANR-GMP-1 at 10. As with the easements discussed above, the Board cannot simply accept ANR's word that these are adequate, and cannot issue a CPG until these plans are finalized, with an opportunity for the parties to review them and provide testimony as to their adequacy.

In sum, Mr. Sorenson made it quite clear in his testimony that "As proposed and without adequate mitigation, I believe the KCW Project will result in an undue adverse effect on the natural environment because of substantial degradation of the two state-significant natural communities and because of significant and permanent fragmentation of the currently unfragmented habitat block associated with the Lowell Mountains." Oct. 22 pf. at 19 (emphasis added). The first of these two concerns has not been addressed at all by the petitioner or the MOU. The Project has not changed, and these two state-significant natural communities will still be just as degraded as at the time Mr. Sorenson provided his testimony.

The second concern has been incorporated into the MOU; however it has not been adequately addressed, and the MOU evinces only an intent to work towards establishing some

unspecified and vague conservation/connectivity easements – no actual mitigation has been secured. Therefore, at this time, the Board has absolutely no reason to accept that the concerns raised by Mr. Sorenson have been addressed, and whereas the Project as currently proposed would have an undue adverse impact on the natural environment, the application must be denied pursuant to 30 V.S.A. § 248(b)(5), or a CPG must be conditioned as discussed above.

V. THE PROJECT DOES NOT PROVIDE ADEQUATE SETBACKS FOR ICE THROW AND TURBINE FAILURE

Findings:

142. Ice can build up on turbine blades and be thrown up to 1,300 feet. This has the potential to cause injury to humans. Zimmerman, May 21 at 14-15.

143. The proposed turbines are more than 400 feet in height.

144. The proposed turbines are within 200 feet of neighboring property lines.

145. As proposed, the Project has the potential to throw ice onto adjoining (non-participating) properties.

146. GE, the manufacturer of one of GMP's proposed turbines, recommends that the setback be greater than 1.5X the hub height plus the rotor diameter if icing is likely at the turbine site. In this case, that would mean a setback of 607 feet. Blomberg Jan. 24 at 35; LMG-LB-13.

147. As proposed, the Project has the potential to allow a turbine tower to fall onto adjoining (non-participating) properties, should there be turbine failure.

Discussion:

One of the dangers of wind turbines is that ice may form on the blades, which can be thrown large distances. GMP's expert, Mr. Zimmerman, explained that "under certain conditions, a rotor may release the built-up ice ("ice throw"), which can cause injury to persons sufficiently close to the wind turbine. The risk to humans of being injured by ice falling or thrown from a wind turbine rotor decreases with distance from the wind turbine." May 21 pf. at

14. Mr. Zimmerman's testimony indicates that the studies he reviewed suggest that ice may be thrown at least 300 feet, and possibly even up to 1,300 feet, from the turbines. *Id*. at 14-15.

While GMP has stubbornly avoided providing any indication of where the property lines are surrounding the Project site, the Nelson's have made it clear that their property is within 200 feet of the turbines, and potentially much closer as there is an ongoing dispute as to the validity of the property line delineation. Regardless, if we accept that the property line is 200 feet from the nearest turbine, this suggests that it is possible for the Nelson's to be walking on their own property and be hit with ice from the turbines, which Mr. Zimmerman admits can cause injury.

While the risk of being hit by ice may be low, it can be made to be zero if the turbines are sited with a proper setback that makes it impossible for them to throw ice onto adjacent properties. It is without a doubt a reasonable expectation for a landowner to not have to worry about ice being thrown from turbines onto their property, and since the distance of ice throw can, and has been, calculated, a setback must be employed that prevents ice throw from impacting adjacent properties.

Similarly, it is unreasonable for GMP to place a 450 foot tall structure within 200 feet of a property line, since that creates an opportunity for the turbine to fall onto an adjacent property should there be a turbine failure. The Board must require that GMP provide sufficient setback to avoid these potential impacts to adjacent properties. A setback of at least 700 feet would appear appropriate and necessary to avoid any unnecessary impacts.[65]

[65] This is a separate and distinct issue from setbacks related to noise, which may require even larger setbacks than 700 feet.

VI. STORMWATER AND DRY HYDRANTS

Findings:

148. The town of Albany relies on water from the Shatney Brook for firefighting. Shatney Brook is fed by the wetlands and headwaters on the Project site. *See* attached letter from Albany Selectboard.

149. Approximately ten years ago this water supply resource was improved when a dry hydrant was added to the brook, paid for with a federal grant. *Id*.

150. The Albany school relies on this dry hydrant for fire protection. If the water levels in the Shatney Brook are altered by this Project, the town would have to retrofit the school with sprinklers at an estimated cost of $50,000. This would be a huge financial burden on the Town of Albany.

151. The Project will utilize stormwater treatment practices, including sediment ponds or basins, that capture flow and hold it while sediment settles out. Burke, Feb. 24 at 160.

152. During dry times of the year, this may reduce the flow of water in the streams that are fed by water flowing off the Project site. *Id*.

153. The Project includes blasting, road building and will re-contour the ridgeline, which may alter the flow of water off the site.

154. GMP has not considered how the Project would impact the streams and hydrants that Albany relies on for firefighting. This issue has not been addressed in the stormwater permitting. *Id*.

155. GMP has not yet received its stormwater permits for this Project.

156. GMP is relying on the stormwater permits to show compliance with 10 V.S.A. §6086 (a)(1)(A) (headwaters), 10 V.S.A. §6086(a)(1)(B) (waste disposal), 10 V.S.A. §6086(a)(1)(E) (streams), and 10 V.S.A. §6086(a)(4) (soil erosion) – incorporated through 30 V.S.A. § 248(b)(5). Nelson, May 21 pf. at 7.

157. Until those permits are issued, the Board cannot find that the Project complies with 30 V.S.A. § 248(b)(5).

Discussion:

Albany is concerned that the construction of this Project will potentially have an adverse impact on emergency services in the town of Albany, which has not been studied or discussed by

the petitioner. The main source of water used for firefighting in Albany Village is the Shatney Brook. This resource is accessed off Route 14 on the south end of Albany Village and is a reliable water supply. Water for fire suppression has been drawn at this location since the fire department was founded. Approximately ten years ago the resource was improved when a dry hydrant was added to the brook, paid for with a federal grant. This is a key feature in the protection of Albany's school, which was built without a sprinkler system based on the fact that there was a close, adequate water supply.

Albany is concerned that the construction activities proposed for this Project will impact the high altitude headwaters and wetlands in the Project area in a manner that would disrupt the normal flow of water in the Shatney Brook. Mr. Jewkes agreed that one of the concerns when constructing and operating an industrial development on a ridgeline is the impact to the streams at the site, and that the stormwater treatment practices are focused, at least in part, on protecting streams from high flow storm events, which can be increased due to the impervious surfaces and changes in groundcover. Burke, Feb. 24 at 158-160. One of the BMPs used to control this is stormwater basins, which hold back flow and allow sediments to settle out, thereby protecting the streams from increased turbidity.

What has not been considered by the petitioner, is whether during drier times when there are infrequent and smaller storms, and the stormwater flow still go into the basins to help reduce the sediment load, if that would reduce the flow in the streams to a degree that would impact the ability of the dry hydrants in Albany to be used by the fire department. Mr. Burke testified that this matter was not considered as part of the stormwater application, and the petitioner has not studied this issue and has not proposed any means of mitigation for problems that may arise related to the Project on the dry hydrants that Albany relies on. Feb. 24 at 160. If this were to

happen as a result of the construction of this Project, which will include extensive blasting and tree removal as well as a re-contouring of the mountains, the effects of which cannot with any absolute precision be known, then Albany would perhaps be forced to spend upwards of $50,000 to retrofit the school with a sprinkler system.

This would be an unfair burden for the Town of Albany, which is already being asked to bear the brunt of the impacts from this Project, including the aesthetic and noise impacts discussed herein and associated impacts to tourism and property values, while receiving almost no financial benefit. Even if the chance of this impact is low, if it were to happen it would be a huge financial burden on the Town. The Board should therefore condition the CPG, if one is granted, on GMP working with the Town of Albany to determine the required (minimum) flow rates needed for the dry hydrants, conducting a pre-construction flow study at the dry hydrants, and performing post-construction testing to ensure that the dry hydrants have sufficient flow following construction – and if they do not, GMP should be required to provide funds necessary to ensure that Albany is able to remedy the problem, including monies to retrofit the school with a sprinkler system if necessary as a result of the construction of this Project.

Furthermore, this Project has not yet received permits from the Agency of Natural Resources (Department of Environmental Conservation) regarding the stormwater treatment practices to be used on the site, which are necessary to ensure compliance with the Vermont Water Quality Standards. The petitioner is relying on obtaining these permits to show compliance with various statutory criteria, including 10 V.S.A. §6086 (a)(1)(A) (headwaters), 10 V.S.A. §6086(a)(1)(B) (waste disposal), 10 V.S.A. §6086(a)(1)(E) (streams), and 10 V.S.A. §6086(a)(4) (soil erosion). *See* May 21 pf. of Mr. Nelson at 7 ("With respect to the potential for undue water pollution, VHBP and Krebs & Lansing will develop both construction and

operational phase stormwater management plans to ensure the proper management of stormwater runoff from the Project site prior to discharge to Waters of the State. Appropriate permit authorizations will be obtained from the Vermont Department of Environmental Conservation….").

As is set forth in the testimony of Mr. Nelson, these matters are covered by permit programs, and require specific plans, such as an Erosion Prevention and Sediment Control Plan, to be approved by ANR/DEC. Since the specific measures that will be taken to protect these resources are not included in this application, but rather are the subject of review by ANR at this time, the Board cannot be assured that they will be adequately addressed unless and until the proper permits are issued.[66] Albany believes that the Board cannot issue a CPG until all appropriate permits are obtained from ANR/DEC, and the Board and parties have the opportunity to review them.

As the Board is well aware, the Vermont Legislature has provided that appeals of ANR permits for Projects such as this are now heard by the Board. Albany and Craftsbury have provided comments to ANR regarding the proposed stormwater treatment plans (attached hereto) and submit that there are some very serious concerns that were raised as to the adequacy of the petitioner's stormwater modeling, and the amount of land that will be concurrently disturbed for

[66] For example, Mr. Nelson states in his testimony that "The effects of soil erosion on adjacent water bodies and wetlands will be managed in accordance with the Project's specific EPSC Plan, which will be developed in accordance with the *Vermont Standards and Specifications for Erosion Prevention and Sediment Control* (VT ANR, DEC 2006). The plan will include the installation of preventative measures, monitoring and maintenance of the measures, inspections, and proactive action taken to properly manage stormwater runoff during the construction of the Project." Nelson, May 21 pf. at 26. The petitioner is therefore not including in this application the actual EPSC plan that will be used, but is rather indicating that the Board should rely on an EPSC plan being created and approved by ANR at some future date.

this high risk Project.[67] If these matters are not rectified by the petitioner, then the project as designed would not adequately protect the water resources on the Project site, and would result in an undue adverse impact on the natural environment. If ANR issues a permit without ensuring that these concerns are adequately addressed, this matter may be appealed to the Board for review. Until that process is complete, and the petitioner has final permits that ensure protection of the water resources on the site, this Board cannot find that the Project complies with the requirements of 30 V.S.A. § 248 (b)(5), which incorporates the provisions of 10 V.S.A. §6086 discussed above. Therefore a CPG, if issued, must be conditioned on the petitioner obtaining final stormwater permits, and all appeals of those permits before this Board are resolved.

VII. CONCLUSION

For the foregoing reasons, the Board must find that:

1. The noise standard previously used by the Board is insufficient to protect public health, and a 35dBA standard (exterior) must be used.
2. The Project, as designed, cannot meet a 35dBA exterior standard.
3. Even if the 45dBA(exterior) 30dBA(interior) standard is used, GMP has not shown it would be met in this case.
4. The Project, as proposed, would have an undue adverse impact on public health and the character of the area due to wind turbine noise.
5. The petitioner cannot rely on NRO mode to meet the applicable noise standard.
6. The petitioner is relying on an assumed 15dBA of attenuation by homes, which does not provide any certainty that a 30dBA interior noise standard would be met.
7. The petitioner has failed to provide adequate information on the Project's impacts to aesthetics, tourism and property values.
8. The Project would have an undue adverse impact on aesthetics.
9. The Project as proposed will have an undue adverse impact on natural communities. At this time, this has not been adequately resolved by the ANR-GMP MOU.
10. The Project does not provide adequate setbacks for ice throw and tower failure.

[67] Mr. Burke testified that the Project would proceed with 14 acres of concurrent disturbance under the proposed stormwater construction permit, even though the maximum amount of concurrent disturbance allowed by ANR for a low-risk Project is 7 acres. Burke, Feb. 24 at 171-173.

Therefore the Project does not meet the requirements of 30 V.S.A. § 248, and the Board may not issue a Certificate of Public Good for this Project.

If the Board, against all of the evidence, does issue a CPG for this Project, the following conditions must be included:

1. That the Project meet a 35dBA 1 hour average exterior noise standard, a 30dBA instantaneous bedroom standard and a 40dBA property line standard.
2. That the Petitioner submit a noise monitoring plan for review and approval.
3. That the Petitioner conduct outside inside level reduction testing prior to construction to show whether the interior noise standard would be met pursuant to the noise modeling. The parties must have an opportunity to review and comment on the results of this testing.
4. That all of the components of the ANR-GMP MOU be met, and all information submitted to the Board and Parties for review. An opportunity must also be provided to conduct discovery and recall witnesses regarding the MOU, once all components are finalized.
5. Adequate setbacks must be provided to ensure that ice throw and tower collapse do not impact adjacent properties.
6. GMP must provide a property value guarantee to those living within 3 miles of the Project.
7. Pre-construction testing and post-construction monitoring of the dry hydrants in Albany to ensure that the Project is not impacting water resources necessary for firefighting, and compensation to Albany for all necessary modifications for adequate firefighting necessary as a result of the Project.
8. All stormwater permits are final, and all appeals to the Board of ANR permits are resolved.

Dated at Jericho, VT this 21st day of March, 2011.

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