STATE OF VERMONT
PUBLIC SERVICE BOARD

Petition of Dairy Air Wind LLC] **Docket No. 8887**

PREFILED REBUTTAL TESTIMONY OF MICHAEL LAWRENCE ON BEHALF OF THE TOWN OF HOLLAND

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TESTIMONY

1. Introduction

Q1. Please state your name.

A1. Michael Charles Lawrence. I'm the owner of Michael Lawrence & Associates PLC Landscape Architects/Site Planning Consultant, 8 Linden Lane, Essex Junction, Vermont 05452

Q2. Are you the same Michael Charles Lawrence who testified previously in this proceeding?

A2. Yes, I am.

Q3. What is the purpose of your rebuttal testimony?

A3. My rebuttal testimony responds to the prefiled rebuttal testimony of Michael Buscher and Ryan Darlow submitted on behalf of the Petitioner, in regards to aesthetic impacts of the project.

2. Response to Testimony

Q4. Mr. Buscher in his prefiled rebuttal testimony distinguishes between the terms 'photosimulation' and 'photomontage'. What is your understanding of these terms?

A4. This is a distinction without a difference. Different sources use these terms interchangeably. Most reference sources use the term 'photosimulations' or 'simulations' to include a wide array of visual imagery useful to help envision what a proposed project would look like if built. For example the United States Department of Transportation,

Federal Highway Administration, Guidelines for the Visual Impact Assessment of Highway Projects, January 2015, Appendix A, p. A-3 defines simulations as follows:

> *Simulations - Two or three dimensional depictions of the visual character of a future state. Simulations range from artistic renderings to computer animations.*

In Chapter 3 - *Computer Graphical Interactive Landscape Visualization* - of their book, The Cultural and Landscape Paradox, University of Amsterdam archaeological and landscape professors Tom Bloemers and Henk Kaars as well as Wageningen University land use planning professor Arnold van der Valk, and Mies Wijnen, former Secretary of BBO – a research program organized by the Netherlands Organization for Scientific Research write*:*

> *Pioneering work in the field of digital perspective landscape visualization is represented first by application of 2D photomontages, also referred to as photosimulations in the context of environmental impact studies, environmental assessment and planning as well as impact regulation under nature protections laws. The sole use of freeze images and pre-produced animations is scientifically questionable because these products mostly show just the best side of planning qua postcard beauty.*

Q5. At several points in his prefiled rebuttal testimony, Mr. Buscher asserts that the images you provided in your aesthetic analysis report, Exhibit Holland-ML-02, were not produced using what he deems to be appropriate procedures. In response to information requests about this, Mr. Buscher cites a number of agency and professional organization publications outlining a 'best practice' of creating visual impact analysis by constructing CAD-based computer modeling. Can you respond?

A5. Yes. Mr. Buscher is missing the forest for the trees. Agency and organizational guidance regarding visual impact assessment technical requirements is aimed at the *project proponent*. It is the *project proponent's* responsibility to provide adequate information to

the public and members of governmental agencies so they have a clear understanding of the project and its visual impact.

One of the sources Mr. Buscher cites is the Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects published by The National Park Service, U.S. Department of the Interior – Natural Resource Report NPS/ARD/NRR-2014-836. In Section 4.10, labeled 'Overview of the Affected Environment' the guide discusses the need to identify and describe all the places in the environment that will be affected by a project:

> *Selection of appropriate KOPs (locations for photosimulations) is critical for an accurate assessment of visual impacts because the bulk of the VIA (visual impact assessment) is composed of descriptions of the visual contrasts of the project likely to be observed by viewers at each of these KOP's, and the potential effects of the contrast on the viewers at the KOP's. These descriptions form the basis for the impact assessment. If too few KOPs are chosen or they are poorly located, impacts on important viewpoints and viewers may be overlooked. If too many KOPs are chosen (i.e., unimportant locations or locations showing essentially the same view), valuable time and effort may be wasted on analyses that do not add significant value.*
>
> *In general, where multiple KOPs are available, KOP selections should include 'worst-case' views, that is, views with the greatest visual exposure to the project, so that important impacts are not omitted from the analysis.*

Professional standards require the project proponents provide reviewers enough information to accurately assess the project including 'worst case' views.

The project proponent's initial report provided 60 photographs, each with an arrow drawn on them purporting to point in the direction of the vicinity of the proposed wind turbine. This not only fails to meet a 'best practices' standards, but doesn't even address the purpose of visual image analysis which is to let people know what the project will look like so they can begin to understand its potential to either fit or change the character of the surrounding landscape. The photosimulations that I prepared attempt to give a sense of the high number of scenarios, some of them in my opinion to be 'worst case' along some of the roads in the area.

The petitioner submitted only three photosimulations rendered through the use of WindPRO software which they altered and replaced in the course of their rebuttal testimony.

While the United States Department of Transportation, Federal Highway Administration Guidelines for The Visual Impact Assessment of Highway Projects (VIA), January 2015, recommends CAD software to produce computer-modeled photosimulations, it does not mandate any one particular methodology. Appendix F to that document, which sets out technical recommendations, includes a directive to persons producing VIA to include clear text setting out the methodology used, as follows:

> *Include a description of the methodology used to produce photo simulations in the VIA document. The following is provided only as an example of photo simulation methodology. Tailor the actual description – including noting the software and equipment used – to the project. "Images were photographed using a >10 megapixel digital single lens reflex camera equipped with a 50 millimeter equivalent focal length lens. This configuration is the de facto standard that approximates the proportion seen by the human eye. The camera positioning was determined with a sub-meter differentially corrected GPS. The visual simulations provide clear before-and after images of the location, scale, and visual appearance of the features affected by and associated with the proposed project and its alternatives. The simulations were developed through an objective analytical and computer modeling process and are accurate within the constraints of the available site and alternative data (three-dimensional computer model was created using a combination of AutoCAD files and geographic information system [GIS] layers and exported to Autodesk's 3-dimensional Studio Max for production). Design data – engineering drawings, elevations and cross sections, site and topographical contour plans, concept diagrams, and reference pictures were used as a platform from which digital models were created. In cases where detailed design data were unavailable, more general descriptions about alternative facilities and their locations were used to prepare the digital models."*

Mr. Buscher and Mr. Knight, in their original testimony, and Mr. Buscher and Mr. Darlow in their rebuttal testimony, provide no such text and thus provide no reasonable basis to authenticate the accuracy of the methods to develop their photosimulations. Obviously, the

methodology used to produce the photosimulations in the original submission was inaccurate as the applicant withdrew, altered and resubmitted those images.

The project proponent did not provide a single accurate photosimulaiton of the proposed project in the initial submission. If their three revised photosimulations are accepted into evidence, they present a very limited view of the proposed project, a tiny fraction of the large number of perspectives from which this project will be visible from a variety of distances.

The petitioner fails to meet the overall purpose of a visual impact assessment – enabling the public and those in decision-making roles to envision what the project would look like if built. That work was left to the other parties, particularly the Town of Holland. Mr. Buscher's initial report included two photosimulations which I found helpful in beginning to understand the scale of the wind turbine project in the context of its setting. The Buscher report's Vegetated Viewshed Map indicated the potential for widespread visibility. Traveling in the vicinity of the proposed wind turbine indicates the same. It occurs that the applicant's lack of photosimulations quietly underestimates its overall visual impact on the pastoral landscape, often foregrounding distant views in Holland, Eastern Derby and along the Canadian border.

Q6. Can you explain the methodology you used to create the visual images in your aesthetic analysis report, *Exhibit Holland-ML-02*?

A6. I utilized aerial photographs, camera photographs, topographic plans, topographic cross sections and distance cross sections to create the images in my report. Here is an example:

Exhibit Holland-ML-03 is an aerial photograph and corresponding site photograph from my aesthetic report's (*Exhibit Holland ML-02*) photo location #1. The aerial photo shows

the site photograph's viewpoint, the wind turbine's location about three miles away and the location of a major landform visible in the background of the site photograph (Page Hill). A straight line from camera location #1, extended through the proposed wind turbine project crosses Page Hill Road near the top of Page Hill. This section of road is clearly discernible in the aerial photo.

Exhibit Holland-ML-04 consists of a USGS topographic map that covers the area from photo location #1 to the Page Hill landform about two miles beyond the proposed wind turbine project and corresponding cross section which models the topography and the location of the wind turbine and its vertical dimensions. A sight line in the section extends from the photo viewpoint through the wind turbine's hub to about the top of Page Hill. A second sight line from the photo viewpoint through the wind turbine rotor blade at the top of its rotation extends well above the hill. This exercises gives a sense of vertical scale and horizontal alignment.

I refined the scale by following these steps:

Exhibit Holland ML-05 – The site photo from location #13 labels the 200 ft. tall met tower (note both its top and bottom are visible).

Exhibit Holland ML-06 – Shows same location #13 site photo with a wind turbine described on the internet as having hub height of 300 ft. shown in scale with the 200 ft. tall met tower.

Exhibit Holland ML-07 – Originally submitted by the applicant compares my wind turbine image with one generated by the WindPRO computer program. The two images are similar, do not "greatly exaggerate the project's appearance" as stated by Mr. Buscher. In fact both images show how the project extends well above the trees into the sky and is greatly out of scale with the elements in the surrounding landscape.

Exhibit Holland-ML-08 – is a section depicting the distance to the wind turbine from photo location #13. It consists of three known points; the camera viewpoint; the top of wind turbine; and the base of the wind turbine. These points form a triangle with a 500 ft. height (wind turbine) and a 0.7 mi. base creating a vertical viewpoint angle of 7.08 degrees. I arbitrarily reduced the site photo's size and fit the turbine image's height into the angle of visibility linework. I noted the distance (marked in red) from the camera viewpoint to the vertical line representing the wind turbine. I projected two more lines from the camera viewpoint, one to 200 ft. (met tower top) and the other to the wind turbine image's lowest blade. The scale of this section is 1 inch = 300 ft.

Exhibit Holland-ML-09 – At a scale of 1 inch = 400 ft. these triangular sections calculate and compare vertical view angles resulting in the wind turbine's apparent size at different distances (locations #13 and #12). Location #12's triangle has a 500 ft. height and a base of 1.0 mi. and vertical viewpoint angle of 5.35 degrees (compared to location #13's 500 ft. ht., 0.7 mi. base and 7.08 degree vertical viewpoint angle). Equal size photos are utilized. The wind turbine in #12 is set at the same distance from the camera viewpoints as #13 and its scale reduced to fit the vertical dimension from the triangle's base to the line forming its top (connecting viewpoint and top of wind turbine).
The met tower, visible in this photo from viewpoint #12 helped insured accurate horizontal placement of the photograph.

Exhibit Holland-ML-10 – Adds four additional viewpoint locations noted in my aesthetic analysis report - Exhibit Holland-ML-02, #5,#19, #14 and #1 to locations #13 and #12. At a scale of 1 in. = 1,000 ft., these additional images represent viewpoint distances from 1.2 to 2.9 miles and illustrate how the apparent vertical field of view shrinks as viewpoint distances from the wind turbine increase. If the met tower was not visible in an image, I based the wind turbine's horizontal location by comparing landmarks in the site photo with the same features on the aerial photo.

WindPRO uses this same process, first establishing a camera viewpoint and wind turbine location on a site plan then having the operator align features visible on both site plan and landscape photo. WindPRO gives the operator the ability to trace lines on the plan that show up on the landscape photograph in order to more accurately coordinate them. In *Exhibit Holland-ML-10* wind turbine locations are placed at the same distance from the photo viewpoint in each cross section. Scale is determined by the height of the lines bounding the triangle at that location.

At photo locations where I did not develop cross sections, I used images close to the size of those developed from cross sections of a similar distance. A review indicates that I slightly overestimated the size of the wind turbine in some of these images and slightly underestimated it in others.

Exhibit Holland-ML-11 was originally submitted by the applicant and shows a wind turbine produced in WindPRO software superimposed over the photosimulation that I prepared from location #10. The WindPRO image shows the wind turbine slightly smaller in scale and placed further to the right in the landscape photograph. When I checked my work, I realized that I'd mistaken a farm further north on Mead Hill Road on the airphoto, for the house in the landscape photo. A straight line drawn on the airphoto between the camera viewpoint and the proposed wind turbine clearly shows the wind turbine located to the right of the small white house.

Exhibit Holland-ML-12 is an enlargement of the image generated at photo viewpoint #19 and depicted in the fourth cross section from the top in Exhibit Holland ML-10. This location is 1.5 miles distant from the wind turbine. Cross section linework shows that the wind turbine is undersized in this landscape image.

Even though slightly out of scale, *Exhibits Holland-ML-11 and -12* demonstrate that the proposed wind turbine dwarfs both natural and man-made elements in the landscape and

is not in keeping with the rural context and character of the area. Its skyline silhouette introduces a dominant focal point from many vantage points, drawing attention to itself and away from the many quiet pastoral scenes in the nearby landscape.

Exhibit Holland-ML-13 and ***Exhibit Holland-ML-14*** (prepared by the applicant) illustrate error in either the WindPRO program or in its operator. Both images utilize the same landscape photograph and claim to depict the same wind turbine. Comparing them; the wind turbines are in different horizontal locations and different distances from the viewer. They extend to different heights in the sky. They're different colors and their contrast levels with the sky do not agree. The wind turbine's rotor blades in *Exhibit Holland-ML-13* are nearly invisible and readily visible in *Exhibit Holland-ML-14*.

Whether it's one or the other, the main point remains - both images illustrate that the proposed wind turbine represents a dominant focal point in the landscape.

Q7. Mr. Buscher states, "Additionally, using his methodology, Mr. Lawrence is not able to accurately portray lighting conditions, including the time of day, time of year, and the direction of light, which is expected of a professional simulation." Do you agree?

A7. Photographs and photosimulations are flat, two-dimensional approximations of reality, not reality. Sharp detail appearing in the real landscape can fade, blend in, or get lost in photos due to backlighting, over or under exposure and color distortion. Deterioration happens because of a camera's limitations in capturing images as well as limitations in printing processes and/or video equipment capabilities.

Our human eyes are enormously more sensitive than cameras. Snap a landscape photograph, make a print, stand at the site where you took the picture and compare it to the real scene. There are significant differences. In this spirit, while computer generated

images (photosimulations) can help provide greater understanding of a project's visual impact on the context and character of an existing landscape, they fall far short of realism.

The ideal way to utilize photosimulations is to go and stand (or sit) at the location where the original photo was taken. Relax and take a few minutes to study the area. Hold a properly sized photosimulation at the proper distance from your eye to replicate actual landscape scale. Compare and notice the difference in the landscape features (trees, open spaces, landforms) depicted in the photosimulation with actual trees, open spaces and landforms. Look carefully at the wind turbine in the photosimulation, then put the image down and imagine the wind turbine in the real landscape. Repeat several times. Practicing this discipline at each viewpoint (photosimulation) location will provide a deeper understanding of the power of the proposed project's physical form to transform the character of each place and thus the overall area. This practice provides insight far beyond what can be found by turning a page in a book or scrolling down a computer screen.

Lighting is a prime example of the difference between photosimulatons and reality.

The Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects published by The National Park Service discusses the effect of lighting in the landscape:

> *Lighting angle and intensity change dramatically in the course of the day, and lighting intensity can change rapidly with the passage of clouds in front of the sun. These changes can have profound effects on the visual effects on the visual contrasts created by facilities, and their appearance can change dramatically as a result. The visual experience of renewable energy facilities is a dynamic visual experience that differs markedly from the unchanging static view of the facility depicted in visual simulations.* (p 39-40)

Exhibit Holland-ML-15 is a photograph included in the National Park Service Guide to clarify the point.

> *Objects that stand out against the visual backdrop typically command a viewer's attention. The visual backdrop of the facility is a key factor in determining the visual contrast it creates as seen from a KOP. Pay close attention to the visual backdrop of a project because lighting, weather, or seasonal changes dramatically change the visibility of a project. When transmission towers are located on ridges, such that they are silhouetted against a uniform bright sky backdrop (often referred to as skylining), the towers typically are much more visible than they would be against a darker and more varied background. On the other hand, sunlit, white wind turbines may be much more visible against dark ground backdrops than they are against bright sky backdrops."* (Pages 48-49)
>
> *When assessing contrast from proposed projects, and especially when viewing visual impact simulations, it is important to pay close attention to the visual backdrop and lighting as seen from the KOP. They should understand that the contrasts as portrayed in the simulation may change dramatically as the lighting changes through the course of the day, or as weather or seasonal changes affect the color of the backdrop.*
>
> *Movement can attract visual attention to a project; photomontages may under-represent visibility of a project because they cannot show motion*. (page 50)

Lighting conditions can strongly affect a "worst case" scenario. The applicant's low contrast images (Exhibit DAW-RD-2) present one look. Along with print technique, the photosimulations communicate a sense that the wind turbine blends into the background. Anyone who has looked at a real industrial scale wind turbine project knows that they are often highly visible even at distances far exceeding three miles. Providing photosimulations depicting 'high contrast' conditions would give the public and reviewers a better balanced and more realistic idea of the wind turbine's potential visual impact. It would also be in keeping with 'best practices' methodology.

Q8 Mr. Buscher says that the turbine photo you uses is obviously taken from a short distance and from below the turbine and that by using this turbine photo you dramatically accentuate the appearance of the nacelle from an improper perspective, contributing to a misrepresentation of the overall appearance of the Project.

A8. A side-by-side comparison of the turbines originally submitted by the applicant, *Exhibit Holland-ML-07* shows that the overall heights are quite close. The wind turbine's height which greatly exceeds everything in the area, natural or man-made, is the central issue around visibility.

The applicant did not designate a specific a wind turbine with accurate width and blade and nacelle dimensions. They did say that it will not exceed 498 ft. in height. Whether the wind turbine is a little wider or narrower, whether the nacelle is a little bigger or smaller doesn't address the heart of the matter. An object 500 ft. tall is highly visible from many vantage points and greatly out of scale with all the elements that comprise this rural landscape.

Q9. Mr. Buscher states that your assertion that "The wind turbine will have significant visual presence along many portions of the roads and open spaces in the easternmost part of Derby, roughly two-thirds of Holland and the southern half of Stanstead." is inaccurate and greatly exaggerates visibility and has no basis in evidence. How did you come to that conclusion?

A9. I simply looked at the Vegetated Viewshed Map provided in Mr. Boucher's report (*Exhibit DAW-MJB-02*).

Exhibit Holland-ML-16 is that map with the Town of Holland boundaries highlighted, a line dividing Holland into one-third and two-thirds. It also labels the easternmost part of Derby and the Southern half of Stanstead.

My observation is that lots of the roads traverse the magenta coloring (turbine visibility) within a three mile radius of the wind turbine. In light of what the map depicts, it seems reasonable to say that many portions of the roads in the easternmost part of Derby, roughly two-thirds of Holland (Holland 7 mi. wide – magenta color spread over 4-5 mi. zone) and

the southern half of Stanstead will be able to see the wind turbine. Because it projects so high above the trees, it also seems reasonable to say that it will have significant visual presence on many portions of those roads. The photosimulations included in my report (*Exhibit Holland-ML-02*) representing 22 locations along those roads indicate that the statement is both reasonable and true and not a great exaggeration.

3. Conclusion

Q10. Does this complete your testimony?

A10. Yes.